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THE
HORSE'S FOOT
AND
ITS DISEASES.

BY
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PREFACE.

Having received, through the partial kindness of Mr. A. ZUNDEL, his authorization to prepare a translation, from his valuable edition of the Dictionary of Hertzels d'Arboval, of the highly interesting and instructive series of articles on THE HORSE'S FOOT, which appear in that work, it affords us great pleasure to be enabled to place the results of our labors before our friends and colleagues in the interests of veterinary science in America. Those who have failed to enjoy their perusal and study in the columns of the AMERICAN VETERINARY REVIEW, where they have appeared in consecutive portions, will now have the opportunity of profiting by their instructions in the more compact and convenient form of the present volume.

It is hoped that this work, which treats of a department of professional knowledge which has been comparatively neglected in the works of English veterinary writers, will be accepted and appreciated by our friends in a manner fully commensurate with the importance of the subject and the ability with which it has been treated.

THE TRANSLATOR.

INDEX.

	PAGE.
Anatomy of the Foot.....	1
Articulated Shoe.....	82
B ar Shoe	82
Bound (Hoof).....	66
C alk.....	52
Symptoms of.....	52
Treatment of.....	53
Canker	14
Complications of.....	18
Diagnosis of.....	19
Duration of.....	19
Etiology of.....	23
History of.....	14
Nature of.....	20
Pathological Anatomy of.....	20
Prognosis of.....	20
Progress of.....	19
Symptoms of.....	15
Termination of.....	19
Treatment of.....	24
Cartilaginous Quittor.....	144
Diagnosis of.....	149
Duration of.....	148
Etiology of.....	150
Pathological Anatomy of.....	147
Prognosis of.....	150
Progress of.....	140
Symptoms of.....	146-151
Termination of.....	148
Treatment of.....	151
Causes of Furuncle of the Frog.....	95
Chartier Shoes.....	80
Chronic Laminitis.....	106
Cutaneous Quittor.....	132
Club Foot.....	8
Complications of Laminitis.....	103

	PAGE.
Conformations, (Vices of).....	6
Contracted Heels.....	66
Complications of	70
Division of.....	67
Etiology of.....	72
Pathological Anatomy of.....	71
Prognosis of.....	72
Symptoms of.....	67
Treatment of.....	77
Corns.....	31
Curative Treatment of.....	38
Division of.....	31
Etiology of.....	31
Pathological Anatomy of.....	35
Preventive Treatment of.....	37
Prognosis of.....	37
Symptoms of.....	35
Termination of.....	37
Treatment of.....	37
Cracks.....	40
Complications of.....	43
Curative Treatment of.....	51
Division of.....	40
Duration of.....	44
Etiology of.....	44
Heredity of.....	45
Hygienic Treatment of.....	46
Prognosis of.....	44
Progress of.....	44
Prophylactic Treatment of.....	46
Symptoms of.....	41
Treatment of.....	45
Crooked Foot.....	9
Cutaneous Quittor.....	132
Symptoms of.....	132
Pathological Anatomy of.....	133
Etiology of.....	134
Treatment of.....	134
D efays's Spreader.....	90
Diagnosis of Canker.....	19
of Cartilaginous Quittor.....	149
of Navicular Disease.....	127
of Tendinous Quittor.....	138
Differential Diagnosis in Laminitis.....	113
Disease—Navicular.....	123
Diseases and Defectuosities.....	5
of the Foot.....	14
of the Frog.....	93

Division of Corns.....	31
of Contracted Heels.....	67
of Cracks.....	40
of Punctured Wound of the Foot.....	55
of Quittor.....	131
Drawing Knives.....	12
Dressings.....	13
Dry Hoof.....	11
Duration of Canker.....	19
of Cartilaginous Quittor.....	148
of Cracks.....	44
of Navicular Disease.....	126
of Tendinous Quittor.....	138
E tiology of Canker.....	23
of Cartilaginous Quittor.....	150
of Contracted Heels.....	72
of Corns.....	31
of Cracks.....	44
of Cutaneous Quittor.....	134
of Furuncle of the Frog.....	94
of Laminitis.....	114
of Navicular Disease.....	129
of Punctured Wound of the Foot.....	55
of Tendinous Quittor.....	134
of Sub-Horny “.....	144
F lat Foot.....	6
Shoe.....	79
Foot—Club.....	8
Crooked.....	9
Pumiced.....	7
Punctured Wound of.....	54
Rammy.....	10
Soft.....	10
Founder.....	98
Frog—Diseases of.....	93
Furuncle of the Frog.....	94
Causes of.....	95
Pathological Anatomy of.....	95
Symptoms of.....	94
Treatment of.....	96
G angrene in Laminitis.....	105
General Operations.....	13
Goodwin's Shoe.....	88
H eels—Contracted.....	66
Complications of.....	70

	PAGE.
Heels—Division of.....	67
Etiology of.....	72
Pathological Anatomy of.....	71
Prognosis of.....	72
Symptoms of.....	67
Treatment of.....	77
Hemorrhage in Laminitis.....	103
Heredity of Cracks.....	45
Hinge Shoe.....	82
History of Canker.....	14
Hoof Bound.....	66
Dry.....	10
Soft.....	11
Horny Quittor.....	140
Hygienic Treatment of Cracks.....	46
Inflammation in Laminitis.....	104
Jarrier's Spreader.....	85
Joward's ".....	91
Keraphylocele.....	43-97
Knives—Drawing.....	12
Sage.....	11
Laminitis.....	98
Chronic.....	106
Complications of.....	103
Differential Diagnosis of.....	113
Etiology of.....	114
Gangrene in.....	205
Hemorrhage in.....	103
Inflammation in.....	104
Metastasis in.....	106
Pathological Anatomy of.....	109
Prognosis of.....	114
Suppuration in.....	105
Symptoms of.....	99
Termination of.....	103
Treatment of.....	117
March of Canker.....	19
Metastasis in Laminitis.....	106
Nature of Canker.....	20
Navicular Disease.....	123
Duration of.....	126
Etiology of.....	127
Pathological Anatomy of.....	126

	V. PAGE
Navicular Disease—Prognosis of.....	127
Progress of.....	126
Symptoms of.....	123
Termination of.....	126
Treatment of.....	129
Operations—General.....	13
Pathological Anatomy of Canker.....	20
of Contracted Heels.....	71
of Corns.....	35
of Cutaneous Quittor.....	133
of Furuncle of the Frog.....	95
of Laminitis.....	109
of Navicular Disease.....	126
Preventive Treatment of Corns.....	37
Portion of the Wall—Removal of.....	13
Prognosis of Canker.....	20
of Contracted Heels.....	72
of Corns.....	37
of Cracks.....	44
of Cutaneous Quittor.....	150
of Laminitis.....	114
of Navicular Disease.....	127
of Sub-Horny Quittor.....	142
of Tendinous “.....	138
Progress of Cracks.....	44
of Cutaneous Quittor.....	148
of Navicular Disease.....	123
of Tendinous Quittor.....	138
Prophylactic Treatment of Cracks.....	46
Pumiced Foot.....	7
Punctured Wound of the Foot.....	54
Division of.....	55
Etiology of.....	55
Symptoms of.....	55
Treatment of.....	60
Quittor.....	131
Cartilaginous.....	144
Diagnosis of.....	149
Duration of.....	148
Etiology of.....	150
Pathological Anatomy of.....	147
Prognosis of.....	150
Progress of.....	148
Symptoms of.....	146–151
Termination of.....	148
Treatment of.....	147

	PAGE.
Cutaneous.....	132
Etiology of.....	134
Pathological Anatomy of.....	133
Symptoms of.....	132
Treatment of.....	134
Divisions of.....	131
Sub-Horny.....	140
Etiology of.....	141
Prognosis of.....	142
Symptoms of.....	141
Treatment of.....	142
Tendinous.....	135
Diagnosis of.....	138
Duration of.....	138
Etiology of.....	138
Prognosis of.....	138
Progress of.....	138
Symptoms of.....	136
Treatment of.....	138
Termination of.....	138
R ammy Foot.....	10
Removal of the Sole.....	13
of a Portion of the Wall.....	13
Rolland Shoe.....	87
S age Knives.....	11
Shoe—Charlier.....	80
Flat.....	79
Goodwin.....	88
Hinge.....	82
Rolland.....	87
Saunier.....	86
Unilateral.....	81
with Ears.....	84
with Short Branches.....	79
Soft Hoof.....	10
Sole—Removal of the.....	13
Slippers.....	82
of Joward.....	91
Spreaders.....	85
Defays.....	90
Jarrier.....	85
Joward.....	91
Lafosse.....	86
Sub-Horny Quittor.....	140
Symptoms of.....	141

	vii.
	PAGE.
Symptoms of Calk.....	52
of Canker.....	15
of Cartilaginous Quittor.....	146-151
of Contracted Heels.....	67
of Corns.....	35
of Cracks.....	41
of Cutaneous Quittor.....	132
of Furuncle of the Frog.....	94
of Laminitis.....	99
of Navicular Disease.....	123
of Punctured Wounds of the Foot.....	55
of Tendinous Quittor.....	136
T endinous Quittor.....	135
Termination of.....	188
Treatment of.....	138
Termination of Canker.....	19
of Cartilaginous Quittor.....	148
of Corns.....	37
of Laminitis.....	103
of Navicular Disease.....	126
Thrushes.....	93
Treatment of Canker.....	19
of Calk.....	53
of Cartilaginous Quittor.....	150
of Contracted Heels.....	77
of Corns.....	37
Curative.....	38
Preventive.....	37
of Cracks.....	45
Curative.....	51
Hygienic.....	46
Prophylactic.....	46
of Cutaneous Quittor.....	134
of Furuncle of the Frog.....	96
of Laminitis.....	117
of Navicular Disease.....	127
of Punctured Wound of the Foot.....	60
of Sub-Horny Quittor.....	142
V ices of Conformation.....	6
W all—Removal of.....	13
Wound of the Foot.....	54

THE HORSE'S FOOT.

BY A. ZUNDEL.

ANATOMY.

In our domestic animals we call the foot the extremity of the leg, and even only the extremity of the digit, for, considered in a zoological point of view, the foot extends from the carpus or tarsus to the last phalanx, inclusive.

The foot of the horse forms an extremely important study on account of the numerous diseases to which that member is subject, and also of the value of the motor powers required from the horse; the old horsemen expressed this importance by the aphorism, "no foot, no horse." This truth finds daily its sad applications in the premature ruin of large numbers of horses rendered useless because of the defects in their feet. All the qualities of a horse are, indeed, considerably diminished and can even be entirely destroyed, by the bad conformation or accidental alterations of these essential organs. The study of the foot of the horse has been the object of many voluminous works, such as those of Girard, Bouley, Bracy, Clark, Anker, Leisering & Hartmann, Lafosse, Gourdon, Reynal, Defays, and many others, to which we refer for the more complete description of the organization of the foot.

This organ is composed of two orders of parts, some *internal*, organized and sensitive; the other *external*, formed of a horny, organic substance, the hoof, but entirely void of the property of vital sensitiveness. The internal parts are bones,

three in number, the second and third phalanges, and the small sesamoid, which form by their reunion the articulation of the foot; special ligaments, which maintain the connections of these bones; tendons, which fill the triple office of agents of transmission of motion, articular ligaments and organs of support of the weight of the body; a fibro-cartilaginous apparatus, superadded to the third phalanx, and which completes, so to speak, posteriorly, and increases the surface by which it rests on the hoof and transmits to the ground the pressure which it receives. These are the lateral cartilages and the plantar cushion; arteries, veins, lymphatics and nerves, remarkable for their number, development and disposition; and at last, a ligamentous, sub-horny membrane, or keratogenous apparatus, forming a continuation of the skin, which surrounds the parts of the foot like a stocking, and upon which the foot rests, as a shoe on the human foot. In this apparatus are formed: the coronary band, which forms a rounded projection at the separation of the skin and the hoof, and which serves as a matrix to the periople and the wall; at its surface are seen numerous villousities or papillæ; the podophylous or laminated tissue which is spread upon the anterior face of the third phalanx, and is remarkable by the sheet of parallel laminæ which it presents at its surface, which are separated by deep furrows in which are received the analogous laminæ of the internal face of the wall; the velvety tissue or villous tunic which covers the plantar cushion at the inferior face of the foot, and is the secreting organ of the sole and frog, its surface covered with villousities similar to those of the coronary band, and like them, of various sizes, and lodged in the porosities of the internal face of the sole and frog.

The external parts of the foot are four in number; the wall, the sole, the frog and the periople. These form, together, a horny box, the nail, or hoof, which is adapted exactly by its internal cavity to the external contour of the sub-horny membrane, contracting with it an intimate union by a reciprocal reception, and thus completing the structure of the foot, furnishing to the sensitive parts an apparatus, thick, hard, resisting and at the same time elastic, which makes one with them, and protects them

against violence from the substances with which the foot, from the nature of its function, must necessarily come in contact. The horny substance which constitutes the hoof has a fibrous aspect ; it is hollowed all over by cylindrical canals, whose superior extremities, widened into a funnel shape, cover the papillæ of the matrix of the hoof, either at the coronary band or velvety tissue, while the inferior opens in the wall upon the plantar border, in the sole and frog, at the external or inferior face. These canals are rectilinear, except those of the frog, which are flexuous ; their diameter varies from 0, 02 to 0, 2 or 04^{m.m.} These tubes are not only hollowed in the horny substance ; they have also proper walls, of very great thickness, formed of numerous concentric layers, received into each other. These are lamellæ of pavimentous epithelium, which constitute the horny tissue ; in the walls of the horny tubes, they are grouped flatwise around their inferior canals, and stratified from within outwards, so as to form successive and concentric layers ; in the intertubular horn, these lamellæ are not stratified in a direction parallel to that of the tubes, but at right angles with it. Around the tubes, the lamellæ have an oblique intermediate direction. A granular opaque substance fills up the space lying between the horny tubes and the papillæ.

The hoof, which is a part of the epidermis, develops similarly, that is, by the constant formation of cells in the layer which corresponds to the mucous malpighian body, at the expense of the plasma thrown off by the numerous blood vessels of the keratogenous membrane. The velvety tissue is the starting point of the elements of the sole and frog ; the perioplic band is the organ secreting the periople ; and the coronary band proper, the matrix of the wall. Upon these different parts, the epithelial cells multiply and flatten into lamellæ, in the direction of the surface of the keratogenous membrane, as they spread from it. The wall then grows from its superior to the inferior border, and the other parts of the wall from their internal to their external face. The villosities of the coronary band and of the velvety tissue are the organs around which accumulate the epithelial cells ; their presence defines, consequently, the tubular structure of the horn.

The laminæ, in the physiological state, do not co-operate in

a sensible manner with the formation of the wall ; the keraphyllous laminae form themselves at the coronary band, at the origin of the podophyllous ; they descend with the wall, gliding at the surface of the layer of cells which separates them from the laminated tissue, a movement of descent which is facilitated, however, by the multiplication in the same direction of the said cells. When the podophyllous tissue is inflamed, whether exposed or not, its latent activity soon manifests itself. It gives rise to a great quantity of hard horn, hollowed, as seen by Gourdon, with tubes, and oblique in a direction backward. These tubes, more irregular than those of the normal wall, are disposed in a parallel series ; they are in form round, villo-papillae, which have developed on the face border of the laminae. In these cases of production of horn by the action of the podophyllous tissue alone, one never sees, between the sensitive laminae, distinctly formed horny laminae in the middle of the other cells, as it is observed in the wall proceeding from the coronary band. The horn which rises on the surface of the podophyllous, immediately after the removal of a piece of the wall, is not a permanent one ; it must be replaced by the horn of the coronary band. This change is complete, microscopical examination proving that the wall which descends from the coronary band, provided with keraphyllous laminae, engages itself under the temporary wall, and slides by the action already described over the surface of the soft cells of the laminated tissue. As soon as this tissue, modified by inflammation, is covered over by the permanent wall, its papillae become atrophied, and its action returns to the limited boundaries of physiological condition.—(*Chauveau.*)

The foot is an organ of support and an apparatus of elasticity ; it is through it that the whole animal machine maintains its relations with the ground, and that it adapts itself in its various movements, so to speak, to its roughness. It is this that, as a last spring, distributes and modifies the force of all the movements of the horny mass of the body, whose columns, the legs, may be considered as the resultant. Intermediate with the body and the ground, the foot transmits all the actions of weight reaching it, and also between the body and the sensorium, toward

which all sensations resulting from its contact with surrounding external substances return, the foot then becoming at the same time an organ of feeling. To adapt it to this triple formation, nature has given to it three properties, in appearance incompatible with each other, which it has, however, harmonized, viz: first, a very great external hardness, due to its horny envelope; second, a certain amount of flexibility, the combined result of the physical properties of its cortical envelope and of the mechanical disposition of its different parts, and thirdly, a highly developed sensibility resulting from the high organization of its tegumentary membrane.—(*Bouley.*)

DISEASES AND DEFECTUOSITIES OF THE FOOT IN SOLIPEDS.

Of all the domestic quadrupeds, the horse is the most exposed to diseases of the foot, which are more or less frequent in him according to the work he is subjected to, the places he lives in, and the nature of the ground upon which he travels. As rare as are those accidents in farm horses, so common are they amongst horses in cities, of heavy draught, and also army horses; in all, in fact which travel continually on hard, paved, and stony roads, and especially in large cities, where all those injuries can but be the result of their constant work on stone pavements, always so rough and slippery. If to these conditions are added the very numerous accidents resulting from bad shoeing, so badly carried on, one will be less surprised to see the foot becoming deformed and altered in different ways, deteriorated, and preserving with difficulty, and for a short time. its state of integrity, and becoming the seat of numerous affections.

We shall distinguish the *diseases proper* and the *vices of conformation* of the foot. The former are generally sufficiently serious to be described in special part. Amongst them some are superficial, as the *false quarters*, *uncomplicated cracks*, or solution of continuity, *thrushes*, *canker*; others of deeper interest, specially the keratogenous apparatus, such as *laminitis*, with its complications and sequelæ, *keraphylocele*, *seedy toe*, and *separation* of the wall, which may extend as far as entire sloughing of the hoof; accidents then due to the suppuration accompanying several dis-

cases of the foot. Some maladies are specially the effects of wounds, of contusions such as *overreaching*, *quittor*, *bruised sole*, *bruised heels*, *corns*, *punctured wounds*; others are results of shoeing, *pricked*, *tight shoe*, *burned sole*; others are deep altogether, such as *boinons*, *navicular disease*, and, lastly, *fracture of the os pedis*, or of the navicular bone.

VICES OF CONFORMATION.

Amongst the vices of conformation some are serious, as *contraction of the heels*, *flat foot*, *pumiced foot*, *club foot*, *crooked foot*, *rammy foot*, and, lastly the *foot with bad horn*.

(a) *Flat foot* (Germ. *Platfuss*).—By this is understood the foot in which the sole, instead of having the natural concavity, is, on the contrary, flat, and by its whole surface about on a level with the border of the wall and the base of the frog; most ordinarily this is accompanied with low heels, more or less contraction, and a well-marked oblique direction of the wall.

Flat foot is generally observed only on front feet, and is very common in lymphatic animals or of low breed, raised in low and damp soils. It may be congenital; large feet, badly shod or used up by an exaggerated work, are predisposed to it; it is claimed that the weakening of the sole by too repeated and deep paring of the sole will ultimately bring it on; it is said that abuse of poultices may produce it; it follows excess of the hollowing of the shoe by the upper surface, which, pushing the wall outwards, obliges the sole to drop lower than its normal level.

The horse with flat foot rests on all parts of the sole at once; there is no elasticity of the arch of the sole, and percussions take place on it entirely. The actions of the animal are heavy, especially as it is commonly seen when the feet are large. When the foot is somewhat tender, the animal lames easily, especially if the shoeing is bad, or rests on the sole or if the animal is obliged to trot on rough or stony roads, which render the percussion very painful. There arises some irritation, which keeps on increasing, and produces several accidents, such as bruised sole, corns, pumiced feet.

The horse which has flat feet often has weak walls, and as the nails of the shoe become loose, this is often cast.

By shoeing, one may remedy this bad condition of the foot. For this, the foot must be pared flatways, the sole spared, the wall relieved only of what is broken off; the frog must be left alone, the heels also: a shoe somewhat wide in the web, protecting, therefore, the sole more than an ordinary shoe does. It will be adjusted so as to rest on the border of the wall only, and not on the sole; still, care will be taken not to hollow it too much or to excess. Sometimes a thick shoe only is necessary, without increased width. Soles of gutta percha or felt are also used, as we will see when speaking of the pumiced foot.

(b) *Pumiced foot* (Germ. Vollfuss).—Thus is called the foot whose sole projects beyond the level of the wall, and presents a convex surface, extending beyond the plantar border, upon which the horse rests. It is the exaggeration of the flat foot. In the pumiced foot the wall has a great obliquity, sometimes even assuming a horizontal direction.

The horse is never born with such feet; this is a malformation, accidental, or resulting from various causes. One of the most common is lack of care of the foot, of necessary caution, for instance, in paring, or shoeing in such a way as to bring the rest of the foot on the circumference of the under part in such a way that the sole does not touch the ground, and ceases to be pressed by it. Too much concavity of the shoe may bring on this result, by resting only on a too narrow part of the inferior border of the foot; and by opposition, not enough concavity will compress the tissues, irritate them, and produce the same alteration. Feet become pumiced by laminitis, but this is complicated with seedy toe. Never, then, is the foot pumiced in its whole extent; its deformity stops always at the limit of the inferior border of the bars; beyond them, behind, on each side are seen the excavations of the lateral lacunæ of the frog, so much deeper that the heels are higher. The hoof does not preserve its circular shape. It atrophies on the side, and presents at the toe an excess of thickness in the wall; the heels assume a greater development.

This deformity is very serious, and disables the horse easily; rest takes place only upon the sole and frog; after, laminitis upon the sole and heels; it is always very painful. Work on hard

ground and pavement is next to impossible. After laminitis, one sees, during walking, that the foot rests upon the heels, and then by a motion from backwards to forwards. An animal with pumiced feet has a tendency to forge and interfere; the slightest bruise of the sole gives rise to serious complications. One often observes wounds, suppurations, &c.

The indications are analogous to those of the flat foot; the sole ought to be spared as well as the frog, the walls only ought to be slightly trimmed; the shoe must be made so as to carry the rest upon the border of the wall and protect the sole. When the foot is not pumiced to excess, one must use a broad web shoe, sufficiently concave to allow the sole to rest in it; but it must not be too excessive, as then the base of the rest would not be very firm. A sheet of gutta percha, or felt, with tar and oakum, may be placed between the shoe and the foot.

(c) *Club foot* (Germ. Bockhuf).—This is the foot in which the wall is straightened more or less perpendicularly, or even obliquely backward, so that the superior border of the wall is more forward than the inferior. The superior levers participate always in this vicious direction, which constantly brings back the rest of the foot towards the anterior part of the wall, and, according to its degrees, makes the animal walk more or less on the toe, even sometimes obliging him to rest on the anterior face of the hoof; the heels are raised from the ground, and the fetlock, instead of being open forward, seems to be turned backward. This deformity, which exists especially in the hind legs, is very common, and is even natural in mules, and supposes, with its presence, high heels, which throw the rest on the toe, which is always very thick. It may also exist with low heels, especially when due to overwork or other accidental cause. Horses which, like mules, are club-footed only by a peculiar condition of parts, walk with firmness, and even pull better and work better on hilly countries. If they are unfit for the saddle, it is because their reactions are hard, and that they tire the rider. It is not so with those which are club-footed from hard work; they continually stumble, are subject to knuckling, to interfering, or even to falling; and for these reasons do they always require a mode of shoeing which would give them the

missing solidity, and render their walk more steady. This circumstance indicates the necessity of sparing the toe, and throwing the weight back on the heels, which, however, must not be pared off too much. The best shoe for such feet must be short, thin at the heels, with a thick toe, slightly raised upwards, and prolonged beyond the level of the border of the wall; small heels to the shoe are often advantageous, as giving an opportunity for rest and relief. The shoe with truncated branches of Lafosse (slipper), which is a short shoe, not extending beyond the quarters, and leaving the heels free, is sometimes used. This shoe is very thick at the toe, and very thin at the heels. It is unnecessary to say that club foot is often cured by tenotomy, or by treatment of the tendinous retraction.

(d) *Crooked Foot*.—We call by this name the foot whose sides are not of the same height; it may be crooked outwards or inwards.

This deformity may result from a vice of direction of the regions above; ordinarily, however, only from a deviation of the phalangeal one. Sometimes it is due to bad shoeing, to bad paring of the feet; sometimes it follows unequal wearing of the foot, it being without shoe. Colts which have never been shod, and are walking for a long time on hard and rough ground, often present this condition.

The horse with crooked feet inwards, specially if the deviation is much marked at the toe, is exposed to cut himself with the internal heel of the shoe—to bruise himself; the horse with crooked feet outwards cuts himself with the inner toe. Besides these, lameness, from lacerations of articular ligaments, may often follow.

This is relieved, specially in young animals, by lowering the side of the wall which is the highest, and sparing the other; the proper shoe for this condition must be thicker in the branch corresponding to the lower side of the foot. The shoe ought to be changed quite often, in proportion to the existing difference in height. If the foot is very crooked, it is difficult to straighten it by having a greater thickness of the shoe; it would make this too heavy. Sometimes it is better to use nails with large-sized

head on the lower side of the hoof; and in these cases one might put on *corks* at the heels, external or internal, as required.

(e) *Rammy Foot*.—This is a defectuosity of the foot, always accidental, in which the surface of the wall offers more or less numerous circles, above each other and running from one quarter or heel to that of the other side. These roughnesses, arranged in rows, rise always from the coronary band, and form as many elevations gradually descending and disappearing towards the inferior border of the wall. They are so much more serious that they are deep, and sometimes are accompanied with lameness, especially when in great number, close to each other, and when the foot is narrow and long. These circles are sometimes sequelæ of laminitis, and accompany seedy toe; the rings then are in the middle of the toe, which is more or less roughened, like an oyster shell, and they disappear only when the primitive alteration is removed. When they are small, not numerous, and grow down without being replaced by new ones, this favorable disposition of the wall must be stimulated by all the means which may stimulate and keep up the suppleness, by light blisters over the coronet. A light shoeing, often changed, is the best in those cases. Circles which reappear continually are due to an intimate and continued alteration, and are in company with other defectuosities, such as contraction, pumiced foot, etc.

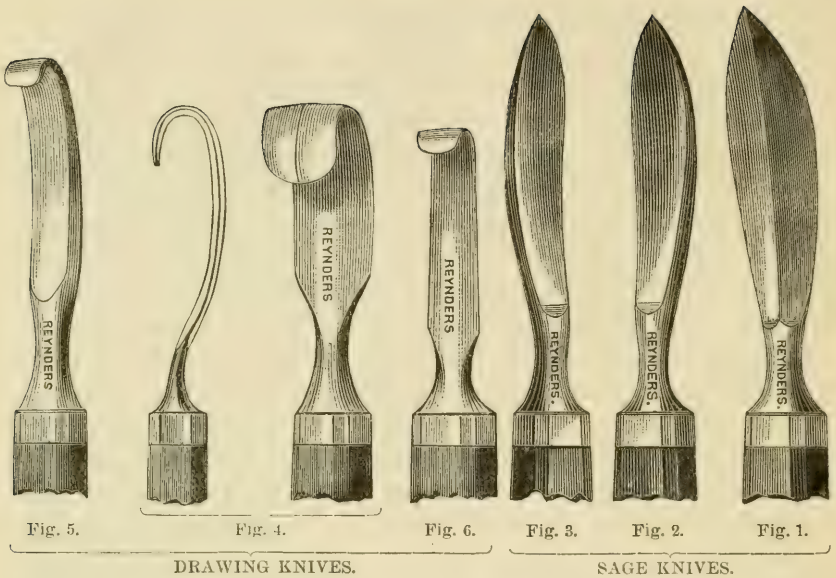
(f) *Foot with bad hoof*.—A hoof may be too soft or too dry. When *too soft*, too greasy, it contains too much dampness and is lacking resistance. Horses which have this weak hoof, as said Lafosse, have the foot tender and unfit for long walks on hard and stony ground; they are, besides, much exposed to lose their shoes, because the hoof breaks up at the nail-holes. This fault is quite common in large feet, frequently seen in Northern lymphatic animals, especially in those which come from marshy districts; if, then, those horses are submitted to stabulation, their hoof becomes dry to excess, which gives rise to narrow and contracted feet. The lower part of the foot must be pared with care, as it has but little thickness; the application of the warm shoe while fitting must be as short as possible. An ordinary thin and light shoe must be used; the nails will be as light and thin as possible, and hammered in carefully.

Too dry hoof is liable to break, because it has lost its physiological suppleness; this brittleness is often met in animals whose feet have been much in water and afterwards are placed on dry ground; it seems as if the water had dissolved the adhesion of the horny cells. The same condition follows the excessive use of poultices and also of strong grease in shape of ointments. It is wise to grease, but previously the old crust must be removed. Hoof ointments of wax, turpentine, or tar are better. The foot is called *dérobé* (broken) when by the use of a thick nail it is more or less broken at the edges of the wall. These feet lose the shoe easily; animals then go on bare feet, and then it becomes very difficult to put other shoes on. It is necessary in these cases to punch nail-holes on the shoe corresponding with parts where the hoof is sound. In paring, all the pieces of broken horn are removed, or at least as much as can safely be done. Nails are secured as high as possible; shoes must be changed as easily as possible, and the hoof is to be kept supple by unctuous applications. When the breaks of the horn are too large, softened gutta-percha, or a mixture of gutta-percha, three parts with one of gum ammoniac, melted together, can be used to fill the anfractuositities, all grease having been first removed by a wash with ether; those putties harden, and the shoe can be tacked on solidly. Nails can even be punched through the gutta-percha.

The surgery of the foot requires special instruments for the operations which influence action upon the hoof, as also for those which are to be performed upon the tissues of the foot proper.

Besides those which are commonly required in ordinary surgery, such as curved scissors, probes, bistouries and forceps, others are needed of special forms and for special purposes; amongst those most commonly used are the different sage knives and drawing knives.

Sage knives are lanceolated blades secured to handles, and are either double or right or left. The blade, which is curved upon its long axis, may be sharp on both edges, as in the double, (fig. 1) or on only one or other edge, when it is known as a right (fig. 2) or left (fig. 3) sage knife, being thus adapted to use by either the right or the left hand.



Drawing knives, which are made somewhat like those used by blacksmiths in the ordinary method of paring the foot, yet differ from those in being straighter in their attachment to the handle, and also on being curved on their long axis, being also sharp on both edges. The groove of the instrument is made to vary in width, and thus can be used as the different steps of the operation may require (fig. 4). Sometimes the drawing knife resembles more that of the blacksmith, as being sharp on one edge only, (fig. 5) and in this case the groove of the blade is generally much narrower than in the others. Some special operations require peculiar forms of drawing knives; for instance, those which are made with a blade perfectly straight and narrow, very slightly sharp on the edges, but having a very narrow groove at the extremity (fig. 6). These are used principally in the scraping of diseased bone-structure, in deep punctured wounds of the foot, and in cartilaginous quittor, when small sections of cartilage are to be removed from the lateral borders of the *os pedis*, which could not otherwise be accomplished.

Other instruments are also required, the description of which will find its place as we refer to the different diseases where they find their applications.

GENERAL OPERATIONS.

Removal of the sole (Germ., Absohlen).—This is an operation by which the sole of the foot is removed by severing it from the living tissues underneath. In times gone by this operation was extensively performed, being considered indispensable as soon as the slightest lesion under the sole existed. It was alleged that unless this was done the suppuration would be likely to spread underneath the horn. In our days, it is rarely performed, as it is considered that it presents but little advantage, so far, at least, as it involves the removal of the entire organ. Sometimes, however, portions of it have to be taken off, as in some special diseased conditions of the foot, such as in punctured wound, pricking by the blacksmith, burnt sole, etc., the *modus operandi* of which will be considered when treating of these diseases.

Removal of portion of the wall.—A few morbid conditions of some parts of the foot require in their treatment the removal of a portion of the wall, in order that the escape of pus, the removal of diseased tissue, or the sloughing of necrosed cartilaginous or bony structure, as in complicated cases of suppurative corns, of quarter crack or in cartilaginous quittor. A similar operation is sometimes required in cases of toe-crack complicated with disease of the os pedis.

These will be further considered when treating of these special subjects.

DRESSINGS.

As nearly every operation of the foot requires a mode of dressing peculiar to the manipulations which have been necessary, we shall, when speaking of the different diseases, where parts of the walls have been removed, include also a description of the peculiar dressing they require.

There is one, however, which is much thought of in veterinary surgery, and of which we will have to say more when speaking of punctured wounds of the foot. This is the dressing with plates, which serve to retain the plantar surface, the balls and pads of oakum, which are placed to protect the wound. The application of these plates is far superior to the leather sole, because of its easy removal when the parts are being examined,

and of their easy replacement; thus allowing the surgeon to change the dressing whenever he sees fit, without being obliged to remove the shoe.

DISEASES.

CANKER OF THE FOOT.

(Germ., Strahlkrebs, Hufkrebs).—Under this somewhat unscientific, though accepted name, is designated a peculiar disease of the feet of solipeds, seated in the secreting tissues of the horny box, always beginning at the frog, and characterized by alteration of the horny secretion. Names of a more scientific meaning have frequently been proposed, such as *gnawing ulcer* (Bourgelat), *schirrus* or *cancerous carcinoma of the frog*, *carcinoma of the reticular tissue of the foot* (Vatel), *dartre of the plantar cushion*, *chronic podoparenchydermitis* (Mercier), and *epithelioma of the frog* (Fuchs). None of these has ever been accepted, and the old hippiatric name has been retained.

History.—It is conceded that the old veterinarians were acquainted with canker, and Vegetius evidently speaks of it, but not until the time of Solleysel do we find a description somewhat complete of the disease and its treatment; Garsault, La Guerinieri, Weyrother and others spoke of it, and have expressed various opinions as to its etiology, and especially as to its treatment. So little progress was discernible in the writings of Bourgelat, Chabert, Huzar and Girard, on that very question, and so many false ideas were admitted, that Chabert in despair has called canker the *opprobrium* of veterinary medicine.

It is but recently that serious researches as to the nature of the disease have thrown some light on the question, and established the important fact that its seat is not in the disorganized horn, but in the secreting organs, and that there is an alteration in the products of this secretion; that it is consequently to these that remedies must be applied.

We might refer to the writings of Jeannié, Crepin, Hurtrel, D'Arboval, Prevost, Mercier, Plasse, Percivall, Dietrichs, Eichbaum, Wells, H. Bouley, Reynal, Haubner, Fuchs, Rey, Megnin, etc., each of whom has furnished his contingent, while still the intimate nature of the disease remains but imperfectly known, and

there is but little certainty either in the treatment or its results.

Let us observe, however, that in our days, canker has become comparatively a rare disease, especially in cities, which, doubtless, is because of the cleanliness of the streets. In the beginning of this century, canker and grease—closely related diseases—were frequent in Paris; then horses were obliged to travel through deep gutters of mud, while to-day these affections are exceptional occurrences (H. Bouley). The same thing has been observed by Percival in England. When hygienic precautions were not as well understood as they are to-day, in establishments employing large numbers of horses, when the stables of mail and stage coaches, and even those of military garrisons, were small, ill-ventilated and dirty, among horses standing in filth and soiled manure, these affections were relatively common; with hygienic improvements, they have almost disappeared. In the army, canker was the cause of considerable annual losses, almost as serious as those from glanders; to-day it is rare and almost unknown.

Improvements in the different breeds of horses, either by better choice of reproducers, or by changes in the mode of feeding, resulting from the progress of agricultural processes, the suppression of common pastures, etc., etc., have contributed to render the disease less common.

Symptoms.—It is seldom that the symptoms of canker can be observed from the start; slow in its progress, and not surexciting the sensibility of the parts, the disease may progress without manifesting any ill effects, and consequently escape notice by the owner or groom, nothing appearing to call his attention to the affected foot. Thus, in a majority of cases, canker is only discovered after it has been in existence for a considerable period, and when serious alterations have already taken place. It is often at the shoeing shop, when the shoes are changed, that in the laminæ is observed a moisture more or less abundant, giving rise to softening and raising of the hoof. The disease sometimes attacks only one foot, often several feet at a time; at times when one foot is cured, another becomes affected, and the disease thus appears traveling alternately from one foot to another.

Usually the disease begins with the inflammation of the keratogenous membrane which covers the median lacunæ of the plantar cushion ; the hoof covering this is softened, raised by a serous moisture, and once loose, is not renewed, the tissue producing it having lost its function of secreting the horny substance, and now secreting a serous element, which becomes the caseous matter of which we shall speak hereafter.

Sometimes the disease begins by moisture in the hollow of the coronet, by a kind of *grease*, a disease which we shall see to be of the same nature as canker. There is an œdematous swelling, warm, somewhat painful, of the phalangeal region, first serous, then becoming opalescent, which seems to filtrate through the softened, but not yet raised, epidermis. This inflammation, spreading little by little towards the hoof, extends to the plantar keratogenous membrane, and gives rise to an exhalation of the same nature as that of the skin, which produces the separation of the hoof, and the first marks of canker.

Sometimes one may observe at once, a fungoid growth or ficus, formed by an hypertrophy of the tissues underneath ; this growth is more or less moist and offensive, bleeding easily, having the aspect of cauliflowers, and protruding through a break of the softened hoof, and forming a thready detritus to be subsequently studied. Commonly, the hoof is more or less loose, and under it there is a caseous matter, greasy, ordinarily of a foetid odor, easily removed by scraping, being non-adherent to the tissue which secretes it. If the parts are well cleaned from this, the velvety tissue of the pyramidal body of the frog appears to be covered with a smooth membrane of a slight whitish color ; the external layer then appears formed by a pellucid epidermic covering, showing through its transparency the purplish color of the capillaries underneath. The velvety tissue is diseased, but still retains its functions, which on the contrary are increased but perverted, and instead of secreting a horny substance which adheres to the surface of the keratogenous membrane, produces the caseous matter already referred to. The breaking in the hoof frequently seems small in size. Nevertheless, the alteration of the keratogenous tissue, viz: the substitution for its normal, of a pathological

secretion, whose product is this loose caseous matter, is far advanced. There is then an extensive, though a concealed separation of the hoof. One then must not allow himself to be deceived into supposing it to be a limited diseased process, by the apparent external integrity of the horny box.

The characteristic of canker is its tendency to spread, like cancerous affections. Once manifested in any part of the sub-horny tissues, the special changes which characterize the disease seldom remains circumscribed; on the contrary, they generally extend from that part as a centre, throughout the whole circumference, and little by little, attack slowly but continuously the whole extent of the secreting apparatus, and thus loosen the entire horny box—starting from the median lacunæ, or the glomes of the frog, it extends to the branches and the body of the plantar cushion; then spreads at the side, in the lateral laminæ, from there all round on the velvety tissue, then by degrees reaches the inferior extremity of the podophyllous laminæ and going upwards, reaches the coronary band, the last point, where, in extreme cases, the hoof preserves its adhesions with the tissues which form it. In this condition the diseased process progresses more slowly than between the sole and the velvety tissue, and then it seems to remain stationary; otherwise the dropping of the hoof would be possible.

We have seen that often at the beginning, but especially as the disease progresses, there are growths called *fici*, found principally round the laminæ, the frog and the sole. These are of whitish color, opal, varying in size and in shape; they constitute an irregular mass, formed of those *fici* pressed together; some of these growths have a wide basis, others are somewhat pedunculated; sometimes they are single, tubercular, slightly elevated; at other times elongated bodies, true fibrous bundles. The *fici* are nothing more than the normal villosities of the keratogenous tissue which have become tumefied and hypertrophied, and are found principally where, in the normal state, the villosities of the velvety tissue are themselves more numerous and more developed. Where these vegetations are confluent, as upon the sharp edge of the bone, they are separated from each other by a kind of deep

sinuous grooves, filled with the caseous matter secreted by the diseased keratogenous structure. These growths bleed easily and grow rapidly again when excised. Those most developed, and which seem to form a homogeneous mass, constitute, however, an aggregate of smaller vegetations united in a certain part of their extent, and continued at their bases.

Besides the vegetation of the living tissues, the plantar surface of the foot presents, in old cankers, isolated fasciculi of solid horny substance, of thready appearance, soft, analogous in their form to coarse brushes whose hairs are glued together. These isolated, still adherent, brushes are seen spreading towards the sole; they correspond with parts of the velvety tissue which have maintained their soundness in the midst of the diseased surface, and there continue to secrete healthy hoof. These horny growths are ordinarily multiple, and are of various shapes, often twisted, and give to the plantar surface a peculiar aspect, so much so, that their brushy masses sometimes retain the mud of the streets and are filled at their bases with a black and fœtid substance of an ugly appearance.

When canker has arrived at a very advanced period, it is characterized by the deformity of the whole horny box, whose length and width is considerably increased. The last of these conditions is a sure sign that the disease has spread under the wall of the quarters and of the heels, and has produced the complete separation of the bars from above and below. When percussed, the hoof at the heels gives a dull sound. The excessive length is only an indirect consequence of the disease, and is due to the fact that, so as to keep the animal at work, the walls are spared as much as possible by the blacksmith, so as to avoid the contact of the protruding parts with the ground.

Physiological signs are almost entirely absent in canker. It is a curious fact that the sensibility which is generally highly increased in all affections of the foot, even in chronic diseases, remains always so obscure in canker that animals may be used for a long time without lameness, though the sub-horny tissues have over a large surface become quite unprotected.

Complications.—Very frequently, canker is complicated by a

disease of the skin, analogous to it, known as *grease*; a disease which, if not entirely of the same nature, as admitted by Plasse, Megnin, &c., is closely related to it. It is often through this that canker begins, and very often the two diseases exist together in the same animal, one sometimes following the other, just as canker of one foot follows that of another.

Among the complications of canker, as generally admitted, are some injuries of the plantar cushion: inflammation and necrosis of cartilages, ligaments or tendons, and even caries of the os pedis and ankylosis, which are sometimes observed; however, a close examination of the facts allows us to say that these accidents do not arise under the simple influence of the disease alone, but that they are due to the improper use of sharp instruments, of the actual canter, and especially of potential cauteries. As La Gueriniere said, the deep lesions of tendons and of the os pedis, which are observed in severe cankers, have no other cause than the action of too powerful dessicatives.

Duration, march, termination.—Canker is an essentially chronic disease, and may be of long continuance, even lasting for years. Still, under this heading there are many variations, whose cause it is difficult to find. There are horses whose disorganization of the hoof is complete after two or three months. There are others where the disease remains stationary for more than a year. We have often seen it remaining limited to one lacuna for months, and all at once assume a rapid evolution of disorganization. We have noticed this principally after the use of sharp instruments.

Generally, animals affected with canker feed well, and for a long time retain a good condition; towards the end, however, they lose flesh and exhibit symptoms of septicohemina, especially if affected with grease. We do not admit that, as advanced by some, canker can give rise to such virulent diseases as glanders and farcy.

Diagnosis.—At the beginning, canker may be confounded with thrushes, and many veterinarians have considered this as the first stage of canker. There is, however, a great difference between the two: first, as to the anatomo-pathological point of view, inas-

much as the pultaceous, foetid secretion is less abundant; that the loosening of the hoof is less, and that there are no fici; and again, especially in the point of view of the treatment, where single cases of cleansing, with or without dessicatives, easily control it, while canker remains rebellious to them.

Prognosis.—The prognosis varies. Where the animal is young, well fed, and the disease is not too old, it is favorable. Yet it remains uncertain, as often the most benign form may last long and remain rebellious to all treatment. The severity and the extent of the internal lesions cannot be estimated by the alterations or deformities of the hoof, as these appearances are often deceptive. Canker, though considered incurable for a long time, is not absolutely so,—far from it; with rational treatment, properly carried on, it is curable in the majority of cases. There are cases, however, not very rare, where relapses and useless attempts have discouraged the owner as well as the veterinarian, and where it has been more advantageous to destroy the animal rather than to submit him to a long, tiresome, and always expensive treatment.

Pathological Anatomy and Nature of the Disease.—It has always been considered that a morbid condition susceptible of producing disorders so severe as those produced by canker, must necessarily be a deep affection, essential and important to the organic structure, and depending on a complete transformation in its texture. And, indeed, it is the impression which predominated from the time of Solleysel down to the foundation of veterinary schools and which still exists with Girard, who considers canker as a gnawing ulcer which changes and alters the tissues it invades, and even with Vatel and Hurtrel D'Arboval, who looks upon canker as the carcinoma of the reticular structure of the foot.

It is but recently that these ideas have been abandoned. Dupuy, in 1827, considered canker as a hypertrophy of the fibres of the hoof, admitting at the same time the disintegrations and softening of those same fibres occasioned by an ammoniacal saponization produced by an altered secretion.

In 1841, Mercier expressed the opinion that canker is nothing more than a chronic inflammation of the reticular tissue of the foot, characterized by diseased secretions of this apparatus.

It is now known that there is in canker, no essential alterations of the sub-horny tissues; no radical change of their substance, and no deposit of heteromorphous molecules in their structure. This last mentioned fact was well observed by Robin, who in his microscopical remarks constantly observed the absence of the characterizing elements of canker. Hertwig and Haubner, who have made researches in the same direction, arrived at the same result and have noticed the absence of any cancerous cells in canker. This opinion is, however, doubted by Glisberg and Fuchs, who look upon canker as an epithelioma, though they bring no sufficient evidence to establish it.

Except vegetal parasitism, of which we will speak hereafter, and which makes of canker a true dartre, an herpetic disease, as demonstrated by Megnin, there is only in canker a chronic inflammatory condition of the sub-horny tissues which is manifested by a perversion in their secretion, and is complicated by a morbid hypertrophy of the villous processes by which their surface is normally covered. Robin has seen in the *fici*, papillæ made thicker and more brittle by the plastic infiltration which moistens them; he has observed besides, that at the points where the secretion is good, it is so active, that instead of drying in sheaths, to scale off afterwards in transverse pieces, as normally occurs in the frog and sole, the epithelial cells grow lengthwise, as those which form the walls of the foot. Hence these long, horned, twisted threads (epithelioma?) which are seen rising from the sole of long affected cankerous feet.

It has sometimes been admitted that *fici* had deep roots in the tissues, and even in the plantar aponeurosis, which is an error; injections and macerations having shown that there are no essential changes in the anatomical structures of these parts, and that what have been considered as the roots of *fici* were only cellular tissue, which has become indurated under chronic inflammation (Bouley.) *Fici* are only fasciculi of villousities whose vascular net-work is no longer retained by the thick horny box which encloses them and which is infiltrated with plastic material.

Bouley has already admitted that canker could not be better classified than amongst skin diseases, with and after dartroid af-

fections, and thus gave reason to Huzard senior; Plass also found that canker had the greatest analogy with grease, and that in it the nutrition of the horn underwent the same alteration with nutrition of hairs in the second affection.

Megnin in 1864, observed, in operating upon fresh pieces taken from the living animal, and from one which had not received any treatment, that in canker there is constantly a cryptogam, as in favus, and that canker is a parasitic affection.

Examining the caseous product of the abnormal secretion which characterizes canker, Megnin found in it a large quantity of very animated vibrios, swimming in a liquid having in suspension numerous epidermic cells more or less advanced in dissolution; he found besides rounded corpuseles, which he recognized as the spores of the cryptogam, and from which the vibrios escaped at the maturity of the granulations there contained. In examining the fici, he has recognized them to be an aggregate of hypertrophied villousities, at the base of which were found in the mass obtained by a slight scraping epidermic cells or parts of cells enclosed in a net work of inter-crossed, ramified threads, appearing to rise from certain centers marked by an agglomeration of spores, forming in their whole a yellow spot. In the water of the microscopic preparations, one finds also, several of these isolated threads, epithelial cells, globules of lymph, of blood and finally spores; very rarely vibrios; oftener micrococci. These threads are nothing more than the parasites, the mycelium product of the vegetation of the spores; those contained in the serosity, swell, break up, and the granulations which escape from them become for some time the vibrios, or as we prefer to call them pseudo-vibrios; as soon as the brownian motion, which for some time animates the granulations, ceases, the cells which have proceeded from them (the micrococci) gather together in chains and form the characteristic threads of the mycelium.

This parasite of canker has been named by Megnin the *kero-phyton* or parasitic plant of the horn by analogy with the trichophyton, the parasite of the hair. We consider this name very appropriate and prefer it to the name of *oidium batracosis*, parasite of canker, which Mr. Megnin has also proposed.

Etiology.—The causes of canker are yet but little known; there is one, however, which cannot be ignored and which, if it does not produce the disease, assists materially in its development and is indispensable to its existence. We refer to the condition of dampness. It is that influence of dampness which explains why the disease is so very common in the marshy lands of Poitou; in the pastures of Holland, and in general in low grounds; and why it is more frequent in northern than in southern countries. Canker is incomparably more frequent in rainy seasons than in those where dryness predominates. We have already seen in the history of the disease that it is since the streets and the stables of administration are kept more free from dampness that canker has become less common.

Sometimes the action of direct irritating causes has been admitted, and then the canker has been attributed to irritating muds and the excrementitious liquids of stables; their contact often giving rise upon the skin, upon the glomes of the frog, to an erythematous inflammation, soon followed by a serous flow, which extends to the sub-horny structures and gives rise to an exudation in the laminae of the frog. This cause produces the rotten frog (thrushes) but not canker. We believe that this cause has principally been admitted by veterinarians who look upon thrushes as the first stage of canker, but this is not so, and for canker to develop itself under similar conditions, others are necessary, which are as yet unknown.

Canker has also been attributed to narrow and contracted feet, so common in horses of meridional climates, and in which the sole is very concave with the frog and pyramidal body shrunk in. Often in the laminae of these feet a sero-purulent moisture is discovered more or less offensive, which is a rotten frog, but not canker, and but seldom followed by it.

To produce canker, a simple irritation of the sub-horny structure is not sufficient. There must be a special cause, proper to canker, stimulating alone the characteristic changes of the cause. This cause we find in the cryptogam which characterizes canker, propagates it, and which, like other living beings, has no power of spontaneous existence.

As with other parasitic diseases, canker is communicable by contagion; although the examples are quite rare, they cannot be doubted. Hurtrel, d'Arboval, Plass, Blind and Megnin have observed them, and in all the cases dampness has contributed to the propagation of the cryptogam.

The lymphatic constitution in an animal is eminently propitious to the development of canker, as it is observed to be, in fact, for all parasitic diseases.

It is known by daily observation of facts that horses whose skin is thick, with the hairy system well developed, the feet flat, with thick frogs, are more often affected with canker than animals of a nervous constitution. It is more particularly observed in horses with much white at their extremities, with stockings and white feet, and in those where there is a tendency to albinism.

An unknown diathesis has also been considered as causing a predisposing constitutional organic condition, but this has not been justified by observation. It may happen that canker cured or dried on one foot, may attack another foot, perhaps a third, and then a fourth, to re-appear in the first; this character of the disease has often been mentioned as a proof of this diathetic condition; but it may also be explained by its contagious character. The disease remains too much localized to be constitutional, as generally in diathetic diseases we have critical eruptions upon different organs or different tissues.

Treatment.—From the preceding remarks, it is evident that in feet affected with canker, the keratogenous apparatus of the foot has undergone no essential alteration in its structure, that its thickness and density have only increased by consequence of the infiltration and organization in its net work of the plastic products of inflammation. And, again, the secreting function of this apparatus, far from being arrested, is on the contrary more active; but the products it gives instead of being conerescible, remain diffuent; hence the impossibility for the hoof to be restored in the regions where this alteration of secretion exists and remains. These important facts, says M. Bouley, must take the lead in the chapter of the therapeutics of canker, because

they teach the practitioner that the object to effect, in the treatment of this disease, is not to radically destroy the diseased tissues, as has been too often done and recommended, but to return to them their physical and physiological properties by the application on their surface, of modifying agents which influence the nutritive and secreting functions of their tissues without interfering with their structure. To reach this point, the most varied pharmaceutical agents have been recommended, the most successful being those which at the same time had parasiticide properties. We however, find it difficult to give the preference to any of them; and we have now more faith in the *modus faciendi*, to the skill of the operator, to the continued use of dressings properly applied, than to such or such agent; all those which have been recommended if methodically applied, can cure canker, and it will be wise to employ them alternatively; when one fails at first it is prudent to try another; canker is a disease so often rebellious to treatment, especially if confined to the lacunæ of the frog, that too many remedies cannot be used.

The first indication is to remove the excess of the horn of the wall, whose length we have said, is often very great; and to prepare a convenient shoe for the dressings. This shoe necessarily varies, as canker is exclusively localized to the plantar surface of the foot or extends to the prodophyllous laminae. Generally an ordinary shoe is used, more or less covered (wide) and so hollowed as to allow the free application of plates by which the dressing is kept in place. When the condition of the disease requires the removal of large pieces of horn, a truncated slipper is used, proportioned in cutting to the extent of the parts of the wall upon which it is to be applied. There are circumstances even when shoes cannot be used, so much does the disease extend under the wall. It is then necessary to use a shoe without nails, or boots, secured to the coronet by means of straps. In all cases the rule is to take care that the dressings remain fixed in the most exact manner, and that through them, a methodic, steady, but not excessive pressure is constantly applied over the diseased parts.

The first step of the operations passed, the next consists in the removal with proper instruments, of all the loose portions of

the horn, either at the plantar surface, at the quarter, or at the heels. One must avoid, in this operation, the excision of soft parts; but the important indication is to follow the disease wherever it exists, and to leave no part of the horn which may have been detached by morbid exudations. Better cut the healthy structures, and have them bleed, than to neglect to completely expose a diseased part. This done, the horn is to be thinned as much as possible, upon the circumference of the diseased spots, in order to give a suppleness which would ease the swelling of the uncovered parts.

Upon the exposure of the disease where it exists, the fici existing on the surface and edges of the velvety tissues are to be removed with the scissors or sharp sage knife; at the same time the parts of horn which may have remained are to be cut off, avoiding, however, the healthy tissue beneath, which still retains its normal character.

When the canker is very extensive, so that the wall is loose on each quarter, or on all its circumference, it is of advantage to proceed in the required operations at different times.

This done, the shoe can be put on; after which the diseased surface and surrounding horn are to be covered with a thick layer of the medicamentous preparation. If this is in form of a paste, as is often the case, it is spread over with a spatula. If in powder, it is thrown over it carefully. If liquid, balls of oakum are soaked with it and placed on, the whole being then kept in place by pads and plates. The important point is that the dressing should be so applied as to be easily changed, that an exact, regular and sufficiently strong pressure be kept on. No better means can be used for this than the divided plates already referred to.

In canker the dressing must be renewed every day, and even twice daily at the beginning of the treatment. This is an essential condition of success, whatever may be the therapeutical agent employed; and this is not a simple difficulty in practice where the patient is not always of easy access. Moreover, this dressing is somewhat complicated, and can only be skillfully made by the veterinarian himself.

It often occurs that upon the removal of the first dressing, (the second day) one finds the tissues already covered by a layer of hardened horn, adherent to their surfaces. One must then, with the finger, a spatula, or a dry pad of oakum, rub it off where it is found loose and movable and if necessary, renew the application of the dressing. The same must be done at the other dressings, carefully watching if this new horn thus formed by the influence of the medication, is not separable from the parts underneath by the different morbid secretions of the disease. One must then carefully scrape off all that is not adherent, and thin the edges, and the projections of all the horn which retains its soundness; the caseous substance being also removed; the same compressive dressing to be put on again.

The modification in the horny secretion, and the formation of a layer of hardened and adherent horn, are especially great in the parts where podophyllous and velvety tissues exist; but are very slow, and surrounded with difficulties in the median and lateral lacunæ of the frog. After ten days of treatment, one may have brought about a normal secretion on the whole circumference of the sole, on the inferior face of the os pedis, and on the prominent parts of the pyramidal body. But in the lacunæ the alteration remains isolated, and resists treatment; and it often happens that, if neglected it may again spread and the disease reach its former extent. It is then the case, when the disease is limited to the lacunæ, to add to the ingredient already in use and which is kept applied upon the restored parts, another stronger and more active agent, sometimes simple absorbent; here again it becomes difficult for us to advise the practitioner, the number of recommended drugs being very large and the result depending less on their nature than in the intelligent and persisting manner with which it is applied. When one thinks to use caustics it must be done with care, to limit their action only to the thickness of the keratogenous tissue, and not to carry it to the destruction of the bone, or still worse, of the plantar aponeurosis.

Let us glance at the drugs which have proved most successful in the treatment of canker: First we have the different pyrogenous preparations, especially wood tar, recommended by Bracy,

Clark, Reynal and Bouley, and which give astonishing results. Gas tar, oil of cade, petroleum and soot have also been used, but with less advantage; creosote and phenic acid have often shown themselves very useful, by penetrating easier to the base of the villosities where the parasite resides and thus acting more regularly; phenic acid proved very useful with Krause, Gerlach and Zundel.

After these the best recommended preparations are the salts of iron; Hertwig seems to be well pleased with the powder of the sulphate, and Arnold recommends the pyrolignite of the same metal; Megnin advises specially the perchloride, which, like phenic acid, is rather a powerful astringent than a true caustic. The preparations of copper have also had their time, and especially the acetates, such as the ægyptiacum ointment (Girard, Schaack, Rainard and Rey); the baths of sulphate of copper were employed by Verrier Jr., of Rouen; a solution of sulphate of copper and of zinc in water or vinegar were recommended by Delaval and Haubner; Solleysel employed the preparations of copper, but added to them arsenic and other drugs; Eichbaum preferred the powder of chloride of lime, and Rauch ordinary lime, while Aubry employed a mixture of lime and caustic potash.

Caustics were well recommended by other practitioners, but their prescriptions seem to be contrary to the rule we have laid down in the beginning. However, one must not forget that the tissues of the foot, especially when diseased, offer an extraordinary resistance to the action of caustics; they are, so to speak, impenetrable, and the irritation they produce remains superficial, while where those tissues are healthy such agents produce a deep cauterization. Again, this resisting force of the indurated tissues against the action of caustics is limited, and it is possible that one, two or three applications may apparently remain inefficacious, where a fourth or a fifth will give rise to extensive cauterization. The result is explained by the repeated irritating influence of the caustic agent, which, by gradually increasing the vascularity of the parts it touches, increases also the means of their absorption and imbibition. These facts must also be present to the practitioner's mind, and it is by them that he will be guided in their

use, rendering them at will, simply modifying, cathartic, or deep caustics.

Nitric acid was used by Percivall and Delorme, the latter considering it the best means in use. Sulphuric acid has also been employed, seldom alone, but mixed with agents likely to reduce its effects and render its applications more convenient. Collignon and Renault recommend its reduction with alcohol; Mercier mixed it with four parts of oil of turpentine; Prange with equal parts of tar, and Plass made a paste of it with burnt alum. This last remedy, very simple in its formula, was applied without any dressing; it has proved most excellent in a great number of cases, but may give rise to too deep cauterization (Bouley, Mandel).

Arsenious acid was much used by old horsemen, combined with oegyptiacum, turpentine and other ingredients. Hoffmann prefers the arsenite of soda in solution; he sold his secret to the Austrian government for a high price. Butter of antimony was recommended by Huzard, Sr., Prevost, and especially Huzard; chloride of zinc was preferred at the Lyons school.

The treatment of canker by actual cauterization was indicated by Solleysel, but soon abandoned by him. In applying the cautery upon the uncovered tissues of the hoof we encounter the chance of producing a very severe inflammation, which spreads by degrees and gives rise to extensive slough of the hoof, as a consequence of the serous exudation which takes place; the action of the cautery may then become either too mild or too vigorous. Still, it has been recommended by Prevost, of Geneva. Hurtrel D'Arboval, who also employed it, used it in the following manner: the parts being covered with a mixture of gunpowder and sulphur, a red-hot iron was applied to the spot, the powder burning suddenly and the sulphur slowly. If the combustion was too slow, he increased it and kept it up by the same means. When the operation is concluded the parts are transformed into a black scar, which can be easily removed by scraping, and the application and cauterization may be repeated, and so on until it appears that a sufficient amount of heat has penetrated the tissues to destroy the material by which canker could be regenerated. The

cauterization being once properly effected, then in order to sustain irritation, the foot is covered with Burgundy pitch, or resin, melted and warm, which is allowed to cool off on the foot, when a dressing of oakum and the shoe are put on. The dressing is changed as soon as suppuration shows itself and renewed with the same ingredients in the same manner until the wound becomes healthy and granulating.

It is only for the sake of the record that we refer to the exclusively surgical treatment, based upon the erroneous idea that the foci of canker are abnormal products, deeply implanted in the tissues beneath, and where it was advised to look for the imaginary roots of these foci at their extreme limits. In this treatment, not only the diseased horn was removed, but the entire sole, the plantar cushion and often the plantar aponeurosis was excised. This practice, advised by Lafosse junior, was also recommended in the veterinary schools by Chabert in France, and Dieterichs in Germany. It prevailed for a long time, though experience showed that the wound resulting from such an operation was of very slow recovery, that the frog especially could not be regenerated, that there remained a central ulcer, and that it gave rise to such a malformation of the foot that the animal remained lame for a long time, sometimes for life. Notwithstanding these objections, observed by Jeune, Girard and Eichbaum, this treatment is still followed by a few who prefer it to the simple operations of Solleysel, which consists in the division of the loose pieces of horn and the excision of the fungoid projections.

We have thus far only spoken of the local, without referring to the internal or constitutional treatment of canker, recommended by those who look upon the disease as constitutional. Without believing that it can have any real curative effect, we, however, admit its usefulness, when the disease is of old standing, and that the animal has suffered much by it. Ferruginous preparations are specially advisable, and we prefer the carbonates that are used by Delwart to the sulphates recommended by Prevost, Delaval and Hertwig, and it is well to unite them with bitters and tonic powders. Arsenious acid is prescribed internally by Delaval, Feuillette, Niederberger, Obich; and other alteratives, such as mercury,

which we would not advise. Nor can we understand how any benefit is to be derived from diuretics and purgatives, and especially from the use of external emunctories, such as setons.

CORNS.

Under this name is understood an alteration of the tissues underneath the hoof; of the heels of the horse's foot by lesions of the living parts in the movements of expansion of the hoof; by bruises, compressions or contusions. There is then a capillary hemorrhage which extends in ecchymosis in the hoof. A corn, then, is a bruise of the living horn at the extreme end of the branches of the sole, and especially in the laminated tissue of the fold of the bars. It is a very common disease, and one to which all horses are exposed. Some have them constantly.

Corns are seen mostly on the fore feet, and on the inside more commonly than on the external side. They are rare on the hind feet, because in the various gaits the weight of the body is carried more on the front legs and on the posterior part of the foot, while in the hind legs it is the front part which principally receives it.

I. *Divisions*.—Lafosse Sr. has distinguished them into *natural* and *accidental*, while Girard considers them all as *accidental*. H. Bouley designates as *essential* those which come from other than external causes. We believe that it would be better to establish the divisions on pathological and anatomical bases, and admit a *corn of the wall, or laminated*, that which has its seat in the laminæ which unites the wall to the tissues underneath, viz., in the keraphyllous and podophyllous tissues of the heels and bars, and a *corn of the sole, or velvety*, that which has its seat in the velvety tissue which unites the sole to the fleshy parts. The laminated corn corresponds exactly to the "natural" of Lafosse and to the "essential" of Bouley. It is due to lacerations in the movements of expansion of a badly made foot. The other is due to contusions. Whatever may be the adopted divisions, we, with Girard, and as admitted in practice, recognize in each category the *dry*, the *moist* and the *suppurative* corn.

II. *Etiology*.—All feet are exposed, but not all predisposed to

corns. They are more frequent in heavy feet, with those where the heels are high or contracted in which there is a motion of retraction of the hoof which interferes with the displacement backward of the third phalanx at the time of rest, and hence the lacerations are easy; besides, there is a continual pressure upon the living parts of the posterior region of the nail. Corns are frequently observed in excessively long feet where the hoof does not receive the moisture necessary to its elasticity; it then loses its suppleness and fails to assist the internal motions of the parts contained within. It is seen whenever the hoof is too dry, the posterior diameter of the foot being then diminished. Corns are seen on weak feet, on which the hoof is too thin to resist the dilating effect of the internal structure, and spreads excessively. Wide and flat feet, with low heels, in which the inferior surface of the branches of the sole is on a level with the plantar border of the quarters and bars, are very often affected with corns. The pressure of the shoe, or the roughness of the ground produce these bruises through the sole. Here the conditions are unfavorable to the normal dilatations of the hoof; the ungual phalanx, being unsupported by the convexity of the sole, has a tendency to drop down lower, the tissues are easily lacerated and bruised in its displacement at the time the foot rests on the ground.

The most serious causes of corns arises from the shoeing, which not only sometimes gives to the hoof a shape predisposing to that disease, but also very often is a determining cause itself of these injuries. "As long," says Hartmann, "as horses will have corns, horse-shoeing can not pass as an art, and their too frequent presence is an evident proof of our imperfect means of protection to the hoof." Without shoeing there would be no corns, and it is in its irrational methods that the true causes of these accidents originate. It is by the greater or less frequency of corns that one may judge of the state of that art in a country.

The faults are found, 1st, in the manner in which the foot is pared, or in the shape which it receives; 2d, in the fitting of the shoe; 3d, in its application. In paring the foot, the sole is often weakened, and thinned too much; it does not resist the pressure, and, at the time of resting the foot, all the weight of the body is

thrown upon the point of union of the sole with the wall. Ordinarily too much has been cut away from the frog, and this not resting any more on the ground, no longer resists the pressure, and the lowering of the branches of the sole is then extreme, as proved by the experiments of Leisering. The custom of cutting the corns, and of cutting the hoof at the heels, acts in a similar manner; the posterior half of the foot is weakened, and that is the part which must carry the greatest part of the weight. One needs only to compare a foot from which the shoer has removed much horn at the sole, frog and bars, with one in which the hoof has been left alone for a long time. In making a vertical and transverse section of the two in the middle of the frog, a little in front of the angles of the sole, he will see at once how weak the point of reunion of the sole with the wall has become, the means of resistance to the pressure of the weight of the body through the third phalanx being thus diminished, and consequently a predisposition to bruises created.

The shape of the shoe also contributes to corns; an excess of concavity; a shoe which from the last nail-hole is not flat to the heels, whose branches are too much inclined, contributes to the lateral contraction of the foot, and gives rise to corns. In this case the shoe resists the play of the horny box, and by itself, through the sole, exercises a great pressure upon the tissues underneath. Too high caulks, in preventing the resting on the frog, cause an excessive pressure on the inside of the foot, and compel it to rest on the heels and the branches of the sole, which are too much lowered. The opposite excess, when the shoe is thin at the heels, as in the Coleman shoe—when it is thick at the toe and thin at the heels—produces a similar result, because in increasing the pressure on the heels, it gives rise to bruises of the tissues through the retrossal processes, which come down too heavily. A very wide shoe, too thin, may also contribute to the genesis of corns, because then, the shoe helping, with the intensity of the reactions on the pavement or on too hard and stony roads, the shoe soon gives under the foot, and compresses the sole and tissues beneath.

The manner in which the shoe is put on may also be a cause of

corns ; the shoe ought to rest exclusively on the inferior border of the wall, and not touch the sole ; when it is too narrow it may be a cause of contusion or of contraction ; if too wide it prevents the natural expansion. It is upon horses long shod that the wrong application of the shoe as a cause of corns is observed. As a consequence of the growth of the hoof, the shoe no longer sufficiently protects the plantar border of the foot, the heels of the shoe being inward and pressing on the branches of the sole ; this is especially the case when the shoe is thinned by wearing ; it yields, and easily bruises the parts of the sole on which it rests ; high caulks, on a branch already too short, or too thin, act the more injuriously in this way, because, not being concentrated on the projection of the caulk, the branch gives way sooner, and presses still more on the heels.

The shoe becomes an indirect cause of corns, when hard substances, as stones or dry earth, are found between its superior and inferior face on the sole, or between the frog and the internal border of the branches of the shoe ; this is a secondary cause, which was formerly considered of great importance.

The work of horses has a great influence ; corns being very frequent in horses which work on pavements and stony and hard roads. They are rare in country horses, but common in those of great cities ; a rapid gait contributes to their development on account of the great pressures on the ground. The seasons have also an influence, dry and warm weather depriving the hoof of its moisture, and by preventing its elasticity of motion, increasing the effect of pressure on the tissues.

Emigration has been considered a cause of corns. Horses coming from the north of Germany are mentioned as having been rapidly affected by them after being in large cities. But if the change too suddenly made from soft to dry bedding is an effective cause, the mode of shoeing can also be considered as a stimulating cause. The same is true with respect to the African horses, which are generally free from the disease in their native country, but frequently suffer with them when brought to France and submitted to a mode of shoeing so different from that of the Arabs.

III. *Symptoms*.—The ordinary symptoms of corns are noticed in the abnormal position of the leg at rest, in the lameness and the sensibility of the region.

When lame with a corn the horse carries the leg forward of the plumb line, and keeps it semi-flexed at the fetlock; he tries to relieve the painful region by resting; sometimes he manifests his pain by pawing and moving his feet from forward backwards, pushing his bedding under him. The lameness is not characteristic; it varies greatly in intensity, from a slight soreness to lameness on three legs. It is generally proportioned to the intensity of the disease. However, there are horses so accustomed to their corns that they do not go lame, while others are very much so for a trifling injury. Sometimes it is intermittent, and diminishes when the suppuration has made its way between hair and hoof. The sensibility of the heel—seat of a corn—is discovered by an exploration with the blacksmith's nippers. Sometimes it is made known by pressure of the fingers, the cases varying, of course, according to the severity of the disease. There is often heat, especially at the coronet, which may be tumefied, particularly so when the corn is of a complicated suppurative character. To obtain an accurate view of the disease the foot should be well pared, and this operation may be greatly facilitated by the application of poultices for twenty-four or forty-eight hours previously.

It is only by the objective examination and the pathological anatomy, so to speak, of the corn that the moist or suppurative variety can be distinguished from the dry; and we shall find either a simple ecchymotic spot, or a complete disintegration of tissues.

IV. *Pathological Anatomy*.—The lesions vary according to the severity of the disease. In *dry corn*, we find an infiltration of blood in the horny structure. This is blood which has transuded through the laminated or irritated velvety tissue from the injured blood vessels. This blood gives to the hoof various tints, more or less pronounced, not unfrequently yellowish, according to the intensity and duration of the disease. The hoof sometimes loses consistency and becomes brittle; at others it is hard and

dry, and then resembles healthy hoof minus its coloration. If the ecchymotic spot involves the whole thickness of the horn, from its surface to its depth, it is an evidence of the continued activity of the cause. A deep mark indicates a recent injury; a superficial one is an evidence of an older corn, which disappears, and then it seldom produces lameness. Sometimes the marks are arranged in layers, the healthy horn being alternated with others which are infiltrated with blood. This is a proof of the intermittent character of the acting cause which has originally produced the corn. The ecchymosis, however, is not the actual seat of the corn, which is more in the velvety and especially in the laminated tissues, which are torn or bruised, the blood escaping through the sole simply by the action of the laws of gravitation. It is rarely that this lesion is looked for in case of dry corn, and it is usually ignored; but, in the confirmed corns, a true alteration of the laminae of the keraphyllous tissue is observed. This is replaced by a horny tumor, a kind of keraphyllocele, analogous to that of chronic laminitis, due to a union of the laminae under the influence of the fibro-plastic exudation resulting from the inflammation, which is of varying size, and presses more or less on the sub-horny tissues. In some cases, this horn breaks up little by little, and gives rise to quarter crack. The ecchymotic spots of dry corn may vary in size; they may range from the size of a pea to that of a ten-cent coin. At other times they may occupy the entire space between the bars and the walls of the foot.

In *moist corn*, there is not only hemorrhage, but also inflammation proper, with serous exudation. The hoof is colored, as in dry corn, of a brownish tint, due to the infiltration of blood which occurred at the start; on searching deeper, one will discover between the hoof and the living tissues beneath a separation of varying dimensions, filled by citrine serosity. Most frequently, this separation takes place at the line of union of the sole with the wall, and extends under both. The horny substance is then more or less impregnated with this serosity, and then has a characteristic yellow appearance and a waxy consistency.

In *suppurative corns*, or more properly, suppurating, the inflammation ends in suppuration. The pus is secreted by the vel-

vety and laminated tissues. It makes room for itself by gradually separating the hoof as its formation progresses. Before long it passes between the podophyllous grooves of the bars and of the quarters, the horny are loosened from the fleshy laminae, and in its ascending progress the pus soon makes its appearance between hairs and hoof at the quarter, at the heels, or at the glomes of the frog. It is not common for the pus to make its way through a hoof of too thick or resisting a nature, unless it has first been sufficiently softened by poultices and thinned down by the knife. This suppuration, in the generality of cases, brings on serious complications, by the excessive pressure to which the sub-horny tissues are then subjected. Gangrene of the velvety tissue near the branches of the sole and of the podophyllous grooves which have been macerated in the suppuration, are very common complications. If the pus remains long in the hoof, its gangrenous results may extend to the os pedis, the lateral cartilage, the plantar cushion, and even to the plantar aponeurosis, and give rise to necrosis or caries of the bones, or to quittor, to a more or less variable extent. This sub-horny suppuration, which may sometimes be considerable, as well as the complications accompanying it, are detected with the probe.

V. *Termination and Prognosis*.—Resolution is a common termination of corns. But their relapse is common also, especially in feet predisposed to them by bad conformation. A kind of chronic condition of the disease, and one which is more liable to become serious than the accidental variety, is the ordinary termination in this case. The mere extent of the disease is of less importance in the diagnosis than the predisposing conditions. Generally, the dry corn is less serious than the moist one, and especially less than the suppurative. Complicated corns, principally in flat, wide feet, with low heels, by reason of uncertain, protracted and expensive treatment, are in general fatal, and necessitate the destruction of the patient.

VI. *Treatment*.—The largeness of the space we have consumed in considering the etiology of corns will compel us to be brief in our remarks upon the *preventive treatment*. Shoeing, which is so often the cause of corns, may also be made a means

of preventing them, even upon predisposed feet, if performed with intelligence and proper observation, based upon the anatomy and physiology of the foot. Generally speaking, one must not proceed rashly by changing too suddenly the mode of shoeing. We do not think that any one specified system of shoeing will with certainty prevent corns, but we do believe that each case demands its special study and care. Usually, a flat shoe, and which has the heels rather thin but resisting, and which rests on the wall proper, even of the diseased one, if not too painful, is to be preferred. If the shoe is for a low-heeled foot, the heels of the shoe should be thicker in order to supply their insufficient height and to offer more resistance to the weight of the body. Sometimes the protecting effect of the shoe must be completed by the use of a plate of gutta percha or leather between the foot and the shoe; India rubber does not answer, as by its elasticity it interferes with the resistance of the shoe. It is absolutely necessary to preserve the hoof in a sufficiently supple condition, to effect which tar, hoof ointments, and other greasy substances are used. Flaxseed meal, poultices of cow manure and salt water, a damp bedding, tallow in the hollows of the heels, all are very good preventives and even curative means, which a careful hostler will not neglect. Paring the feet thin, as practiced by some, is very objectionable, and is a serious obstacle to the extirpation of corns. The feet should be pared as little as possible, especially at the heels or in the lacunæ.

As for the *curative treatment*, there are, according to H. Bouley, four indications to follow: First, remove the acting cause; second, treat the injury it has produced; third, relieve the pressure upon the diseased region, until it has returned to its healthy condition; fourth, prevent the return of the injury.

The first indication is easy to fulfil with the accidental corn, but often nearly impossible in that due to a bad conformation of the feet. The second indication varies according to the extent of the disease. Generally it is advised to thin down the hoof at the bruised part and its surroundings, so as to relieve the pressure on congested or inflamed parts. Still, we are not in favor of too much thinning of the hoof, and except under peculiar condi-

tions, would practice it very slightly. Even in the moist corn, we believe in leaving to the hoof a certain protective thickness. The pressure can be sensibly diminished by the application of chloroformed-oil, or of tincture of creasote; they very readily penetrate the hoof, and act directly upon the inflamed parts. We believe that excessive paring, the "cutting out of the corns," to use the shoer's expression, is injurious, and predisposes to new corns, by weakening the region and promoting a more rapid desiccation and contraction of the hoof. In all cases of dry and moist corn, one must avoid making the parts bleed, the exposure of the soft tissues, and all unnecessary cutting. Thinning is necessary in suppurative corn; and has to be done over the whole extent of the separation of the horn, and a wide channel of exit made for the pus on the side of the sole. It is a wise plan not to remove the entire mass of the loosened hoof, as by this the dressing will be much facilitated.

Cold baths are useful in all cases of corns; at other times poultices of bran or other material are preferred. Sometimes sulphate of iron or of copper are added to the bath, especially in the moist corn. In the suppurative kind, when the suppuration is irregular, and when complications are likely to follow, warm and slightly aromatic baths are better, and after this, a dressing with tincture of creosote, renewed the same day or the next. Later, cold iron or copper baths may be used again; if the suppuration has broken out between hairs and hoofs, injections of Villates' solution, after free escape of the pus by the plantar surface, are indicated.

In the complicated suppurative corn these means are insufficient. We must cut deeper, and for this the animal must be thrown. Then, when the diseased tissues are exposed by the removal of the loosened hoof, the nature of the lesions must indicate the requirements of the treatment. The velvety and podophyllous tissues, if gangrenous, must be excised as far as their diseased condition extends; carious bone is to be scraped; the fibrous and fibro-cartilaginous structures, if necrosed, are to be excised or cauterized, or sometimes left alone and watched, according to the peculiar character and extent of their lesions and

the extent to which they exist. Once operated on, a dressing with plates and bands is applied, and the animal allowed to rise.

It is by a peculiar shoeing that, for some time, the painful heel must be relieved from supporting its part of the weight of the body, and protected from outside pressure. This is the "bar shoe." By the transverse bar, which unites both branches, it presents a support to the frog and protects the heels. The resting of the shoe takes place equally upon the wall of the toe and of the quarters, especially the external, and it does not rest on the diseased heels which may have been first cut away. Some veterinarians prefer the truncated, or the oblique bar shoe, or that with a bar forming an acute reentering angle; Hartmann recommends the first; Mayer prefers the bar shoe in which the bar or heels have been thinned down, and even hollowed, to avoid as much as possible the pressure on the diseased part; this shoe has sometimes given us good results in horses with a weak frog. In many cases, ordinary shoeing answers; then the diseased hoof is pared down. The branch of the shoe in this case requires a greater thickness. Whatever may be the mode of shoeing used, much advantage can be obtained by the application of a sole of leather or of gutta percha.

SANDCRACKS.

Seime of the French; *Hornspalt* of the Germans; *Fissura* of the Italians—are fissures or solutions of continuity observed on the walls of the foot, ordinarily very narrow, which follow the direction of the horn. Principally observed on the hoof of solipeds, it has been seen also in ruminants, but rarely, and of little importance.

I. *Division*.—They may exist on every part of the wall. On the median line of the nail they are called *toe-crack*, and then are more frequent on the hind feet. They are rarely found on the outside or inside toe (the *mamelles* of the French), but commonly met with on the quarter (*quarter-cracks*), then situated on the lateral parts of the wall, towards the heels, and more frequently on the fore feet, especially on the inside. They are sometimes oblique, relatively to the thickness of the wall. Cracks

are superficial or deep, according to the thickness of the wall involved. They are *complete* when they extend from the coronary band down to the plantar border; *incomplete* when more limited. In this last case, those which do not extend up to the skin are the more disposed to recovery, and will grow down with the growth of the wall, while those which extend to the coronary band are more serious, being continually aggravated as the growth of the hoof progresses. According to the date of their formation, they are called *recent* and *old*. *Simple* cracks are those which only involve the wall; they are *complicated* where there is a more or less serious lesion of the tissues beneath, such as inflammation of the laminae, hemorrhage, or caries of the bone. A serious complication is that of keraphylocele.

II. *Symptoms*.—Often the solution of continuity is the only one observed, and it is the special characteristic of the disease. But the fissure may be masked, either accidentally or by design. It may be concealed by the hairs; by the mud; or covered by hoof-ointment, tar, wax, or even a putty of gutta-percha. Concealed internal cracks have sometimes been discovered, such as fissures involving the internal face of the wall, which, consequently, were not noticed from the outside, or showing but a slight depression on the surface of the wall. These cracks are only discoverable when the foot has been well pared down. As slight as the solution of continuity may be, it participates in the motion of dilatation of the foot, and is better detected when the foot is raised than when it rests on the ground. This is the case when it is a toe-crack, but on the contrary, the quarter-crack is more open when the animal rests its weight on the leg; in which case, the separation of the borders of the cracks may be from two to four millimetres, and may expose the bottom of the fissure. Ordinarily, cracks appear first at the coronet, and there is then but a slight opening, but as they become older, and grow down, they have a tendency to become deeper and more complete. When of old standing, their borders are rough and scaly, having between them an ulcerated tissue and sometimes a fungus growth, from which escapes a sanious fluid. In other cases, as of quarter-crack, the edges have a tendency to cover each other.

Superficial cracks are not always attended with lameness ; it is, on the contrary, often very severe when they are deep. The pain is generally in proportion to the depth and the degree of opening of the fissure, and also especially to any complications which may exist in the tissues beneath. The lameness seems at times to be due to the injury of the deep, soft tissues, and to be caused by the motions of the horny box when they become pinched, irritated and bruised. The affected animals are especially lame when the foot rests on the ground, and the lameness is greater on a hard than on a soft surface. If an animal suffering with toe-cracks is moved on descending ground, the lameness is greater than on ascending a hill, the weight of the toe in the latter case producing less opening of the edges of the solution of continuity. In quarter-cracks, the severity of the lameness is always in proportion to the rapidity of the gait ; many horses which are but slightly lame on a jog, become much more so when the gait is accelerated, the dilatation of the heels being greater, and the separation of the borders of the crack increasing in proportion to the speed. When there is lameness, there is naturally an increase of heat and sensibility of the foot, especially at the seat of the crack. This is often discovered by feeling with the hand ; old cracks are generally accompanied by a thickening existing at a corresponding point of the hoof. A deep, but recent crack, is apt to be accompanied with hemorrhage ; there is blood which sometimes exudes between the borders of the crack, and flows in abundance when the movement is rapid ; an old crack, in similar circumstances, may show pus, sometimes mixed with blood. A misstep, a sprain, may give rise to hemorrhage in cracks which are ordinarily dry. In toe-crack, the solution generally involves the thickness of the wall, through which it runs in a line almost parrallel to the median plane of the body, while in quarter-crack it is often oblique and irregular, not exactly following the direction of the fibres, but following the thickness of the wall obliquely, in such a way that the external solution of continuity is more posterior than the internal. If the crack is rather old, and the foot where it exists is contracted, it is generally incurvated, one border covering the other, and sometimes they seem to be

moulded on each other so as to cover and conceal the true crack.

III. *Complications*.—Amongst these we may first mention the inflammation of the reticular tissue, which is first pinched and injured. This may be followed by suppuration and local gangrene. Very often the disease is followed by necrosis of the os pedis, and caries of varying depth. In toe-crack, cases have been seen of caries of the tendon of the anterior extensor of the phalanges, and even arthritis, though rarely occurring, has been observed. In quarter-crack, one may have cartilaginous quittor and suppurative corns. As before stated, these lesions are indicated by the severity of the lameness, the presence of the blood or pus through the crack, and the extreme sensibility of the part. It is especially when, in the course of treatment, a part of the hoof has been removed, that the keratogenous apparatus has been exposed, that the abnormal coloration of the podophyllous tissue is seen, in its swollen condition and its sensibility to pressure, accompanied with the presence of the pus or sanious discharge, and at times the necrosis of the bone. Sometimes, also, foreign substances, as dirt or gravel, may be found introduced in the cracks, and acting as causes of irritation to the sensitive tissues below.

A complication, not so frequent, however, according to some authors, is that known as *Keraphyllocele*, and which consists in an hypersecretion of horn, from the coronary band on the inside of the crack. Sometimes the horny growth remains separate from the borders of the crack, and is adherent to the wall only by its base, towards the coronary band; this is especially the case when the wall has been thinned down or partly removed. In other cases it is adherent to the two borders of the crack, and this forms a natural cicatrix. This horny column of varying length and strength, according to its age, presses upon the tissues beneath, and gives rise to severe lameness. With time there is corresponding atrophy of the podophyllous tissue, or even of the os pedis. This is often followed by a marked deformity of the hoof, and especially a deep fissure, parallel to the direction of the crack. The soft tissues under the keraphyllocele often, in time, become harder, in consequence of the disappearance of the papillæ; the hoof then is no longer adherent to the tissues

beneath, and so incurable cracks are the result. A double wall or false quittor have often also been observed. Thus deformed, the foot is always subject to lameness, even if the crack is cured. Contraction or atrophy of the frog have been observed with quarter-crack.

IV. *Progress, Duration, Termination.*—Ordinarily cracks once existing become worse. From being superficial and imperfect they become deep and complete as a natural result of the ordinary motions of the foot. If rest and some hygienic attention can be given, they may recover spontaneously, and disappear by the natural downward growth of the hoof. This fortunate termination, however, is principally obtained when the crack is due to accidental causes, without deformity of the foot.

V. *Prognosis.*—Simple cracks, superficial and incomplete, especially arising from the plantar border, almost always recover under rational treatment, which has for its principal aim the prevention of increase in the size of the fissure. Cracks starting from the coronary band are always of a more serious nature, with a tendency to increase easily. Still they are no longer to be considered incurable. Cracks in which the borders are much separated by the motion of walking; those which are oblique; those whose edges are incurvated inwards; those where a portion of the wall is loose; those which bleed, and those where there is a continued irritation of the sub-horny tissues, are the most serious, so much so that they may require quite serious surgical interference, and after all baffle the best skill of the operator.

VI. *Etiology.*—The causes of cracks vary greatly, and are often multiple in a single case. Seldom the result of accident, they are most commonly the combined effect of both a predisposing and an extraneous cause. A frequent one among others is the relative dryness of the hoof, which then become excessively brittle. We have seen the conditions in which the hoof loses its natural flexibility, and shall here only state that alternate changes from dampness to dryness have as much influence as the dryness alone. Cracks are more frequent in animals working along damp than in those pulling in dry and stony roads. They are common in animals which, after being kept in pastures, are

placed in good paved stables, with dry bedding. It is principally in these conditions we find the quarter-crack. During some seasons, while a term of dryness follows continued wet weather, the conditions are favorable to their formation, and they often assume an epizootic form. Emigration to dry climates is a frequent cause, by producing the contraction of the ungual structure. This last circumstance explains why cracks are more common in army horses, which are called to go on long journeys during the warm days of summer. But if the European horse taken to Africa suffers less from the disease, a similar result occurs in the African horse when brought to our climate. The Arabian horse readily contracts quarter-cracks in our stables, and with our shoeing. Animals with small feet, or with hard and thick hoofs, have a natural predisposition, which is also found in Hungarian, Russian or Tartar animals. Feet excessively large are also easily affected with the disease, especially those which have canker or grease.

Unskilful shoeing may predispose to cracks, and this is principally the case if the wall is thinned or rasped down too much ; the same result is obtained from shoes which are too wide or too heavy, or which are kept on by too heavy nails.

Feet with the toes turned outwards are predisposed to it, as in these the weight of the body rests more on the internal quarter, which being thinner than the external, give way the easiest. Contracted feet are subject to it. Quittor, suppurative corns, and some other diseases are also predisposing causes. Among occasional or accidental causes may be mentioned traumatism, contusions of the foot, and blows during work. The service of heavy trucking for heavy horses exposes the hind feet to toe-crack, especially if the pulling is done in going up hill or on slippery pavements ; mules' feet are very subject to it, and heavy falls in jumping and external blows are occasional causes.

Heridity in cracks has been mentioned. We do not admit this except so far as it belongs among the predisposing causes which may be transmitted, and we should object to an animal for breeding purposes, if, though otherwise well formed, he were affected with cracked feet.

VII. *Treatment*.—Prophylaxy ought to be the principal treat-

ment of cracks. It is not always easy, however, to prevent them, and it becomes important, therefore, to treat them as soon as they appear. One ought at least to try to prevent them from becoming complete and deep. This form of treatment may be called the hygienic, as it is not properly curative, and so long as the crack is not yet completely formed, by this means the animal may be kept at work as if everything was normal. Curative treatment is that which is applied to the deep or complete disease, more or less complicated, and it most commonly consists in removing that portion of the wall which bruises and irritates the tissues beneath, and in equalizing the wound. In general, there is no necessity for haste in operating, the hygienic treatment being often sufficient to obviate the need of serious operations. The distinction between the hygienic and curative treatment is not however, always definitely marked, and quite often the two modes of treatment must be combined, both the hygienic and curative being necessary.

The *prophylactic* treatment consists specially in the application of tonics, with the object of preventing the hoof from drying. Its normal hygroscopic condition must be preserved, and it must be prevented from taking up too much of the dampness of the ground upon which it travels, as well as from losing that which keeps up its flexibility. At times it must be rendered more moist and, according to the requirements of the case, recourse must be had to hoof ointments and other greasy substances, glycerine, and astringent poultices. At the same time the shoeing must be carefully attended to; the shoe must not be too heavy nor too wide, and should be secured by nails of a proper size.

The *hygienic* treatment has for its first and principal indications to prevent the solution of continuity from increasing, from extending through healthy structure, and especially to new hoof, as this is secreted by the coronary band. The borders of the cracks must, therefore, be prevented from separating in the movements of dilatation of the foot. The normal suture of the wall not being produced by the natural process, or at least, producing it only in keraphyllocele, which is likely to be as injurious as

the crack itself, the borders of the crack must be brought together artificially.

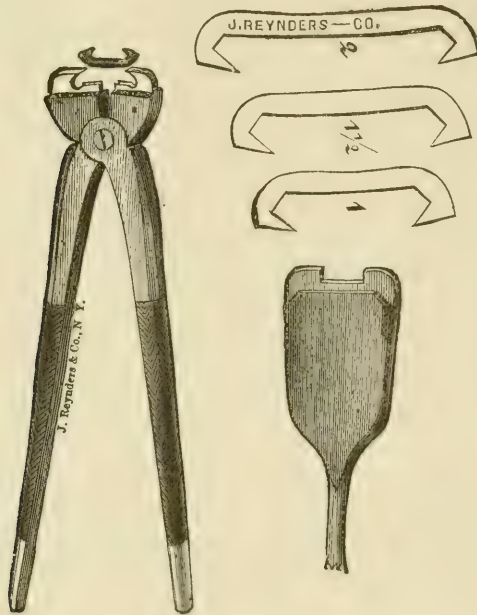
It has been supposed that this could be done with the putty of Defay's, a mixture of gutta percha (2 parts) and gum ammoniac (1 part), introduced into the well-cleaned fissure in a solution, and pushed in as deeply as possible by a warm iron plate or a spatula. This putty is excellent for superficial cracks, but is insufficient to bring the borders together when the fissure is somewhat deep, or especially if it is irregular and sinuous.

A better way, at least for toe crack, is that which consists in suturing the edges of the solution of continuity by metallic clasps, which immobilize the hoof. This mode is always preferable to circular ligatures of wire or cord, which have the effect of interfering with the natural elasticity of the hoof. Clasps only fix the hoof locally, and are an old means of treatment, having been used by Solleysel and Garsault.

It was advised to perforate the horn through and through, with a small punch, and pass a wire, which was bent over the crack, or twisted together at the ends. The same authority recommends the driving of a nail through both edges, and securing it tightly, as in the application of the nails of the shoe. This treatment was recently recommended by Haupt, Lafosse and Rey. The first of these professors takes an ordinary nail, with a small head, drives it through one edge of the crack, so as to come through the other at an equal distance from the point of entrance; the nail being thus driven to the head the borders of the crack are then brought together, and the nail secured in the ordinary way. Two or three of these clasps are employed, according to the extent of the crack. Lafosse makes a groove on each side of the fissure, about one centimeter from the border, in a direction transverse to that of the fibres of the wall, which limits the passage of the nail. The nail is then introduced and secured as in the first instance. Rey makes a track for the nail first, by drilling a hole through the borders of the crack. The animal must be cast during these operations.

The best kind of clasps or hooks are undoubtedly those of Vachette, which require special instruments for their application,

but give a real solidity to the means of fixing the position of the parts. The clasps are all prepared, made of strong wire, bent at



both extremities, and slightly sharp inwardly. (fig. *a.*) These are secured on the foot by a special nipper or forceps, (fig. *c.*) in the notches made on the wall with a special cautery (fig. *b.*); this cautery has its extremities flattened, the width of the clasp apart from each other. The forceps used to secure these is strong; its branches are flattened from side to side, and grooved inwards, and sufficiently apart from each other, while it is open, to receive the clasps between its border; these branches, with the clasp, are exactly fitted to the notches made in the wall with the cautery. It is sufficient to press the branches of the forceps, to close the teeth or extremities of the clasps, and bring firmly together the borders of the cracks. The number of clasps varies according to the case under treatment.

A very simple mode of effecting reunion of the borders of the

crack is that of Hartmann. It consists in applying upon the wall a sheet of iron, adapted to its outside, and secured on the foot by two small screws.

Clasps are of a certain utility for toe cracks, but they often fail in quarter cracks, on account of the thin condition of the wall, which is particularly well marked in some feet. If the living tissues are encroached upon, the clasp may give rise to complications, and still it is in that region that the effects of the motion of the hoof must be prevented, and where immobility is essential, to prevent the separation and spread of the edges of the crack.

Castandet has indicated a mode of treatment which has proved very successful, and which may be applied to both toe and quarter crack, where the fissure of the wall extends from the coronary band to the lower border of the foot. It consists in making a groove at about one centimeter on each side of the crack, which in depth extends to its bottom, which, when reached, is white. If the solution does not go to the lower border of the foot, these grooves are made obliquely, and so as to meet together at their lower termination, and form a V shape. Thus the crack cannot increase, and it grows down without injury to the soft tissues. Castandet, after this operation, cauterizes the coronary band.

The transversal groove, recommended by Levrat, which cuts the tissues in two and extends beyond the crack on each side about three centimeters, which goes down to the soft tissues of the foot, and not beyond them, has for its object to diminish the effects of percussion produced by the contact of the foot with the ground. It however, does not prevent the edges of the fissure from separating, as the groove of Castandet does. It is chiefly useful when there is separation of the wall, or false quarter. At times a transverse groove has been made to prevent an incomplete fissure, starting from the plantar border from spreading to the coronary band. According to Hartmann, a single hole drilled through the wall is, in these cases, sufficient.

Shoeing is of much assistance in the hygienic treatment of cracks. In toe cracks, the toe should be spared as much as possible while the heels are lowered by paring, or by the application of a shoe thicker at the toe, or by the removal of the calks at

the heels. While Defays holds that the shoe ought to lie close and tight to the plantar regions of the crack, Hartmann, on the contrary, advises the paring of that surface at the toe, so that the shoe cannot rest on the crack, and recommends the application of two clips on each side of the toe.

In quarter cracks, it is recommended to lower the toe, to save the bars and the frog; and when the crack is incomplete, and not accompanied with lameness, Defays recommends not to lower the diseased quarter, and to have the heels resting well on that branch of the shoe, which shall be thick and straight. Schrebe advises a calk on that side. If the crack is deep, with excessive lameness, and deep lesions, the quarters and heels must be pared down as much as possible, and a bar to be then put on, resting on the frog, if need be. An ordinary shoe with a thick branch may be sometimes employed.

As part of the hygienic treatment, we may consider the means recommended to increase the secretion at the coronary band. It is known that a slight irritation at that part of the foot is accompanied with an increased secretion of hoof, which is sometimes sufficient to give rise to a new growth of healthy horn. One of the most common methods is to slightly cauterize the coronary band with the iron. This was already known by old practitioners, who employed an S cautery; but they committed the error of burning the hoof too deeply, instead of simply cauterizing the coronary band. Solleysel speaks of the cauterization of the band. Garsault mentions only the burning with three Ss across the crack. Such cauterization could have no useful effect, and the deep application of the cautery might be followed by serious complications. For these reasons Lafosse objected to them. In our days it is abandoned, and the coronary band only is touched by the cautery; Castandet and Rey also employ it. Chemical cauteries have also been recommended, nitric acid by Laguerriere, and more recently by Lafosse.

Putty of corrosive sublimate and ointment of oxide of mercury are also in use, but have no marked advantages. Blisters prove very beneficial, and also turpentine, as recommended by Lafosse and Rey, and the oil of Gade by Maury. Defays ad-

vises the putty of gutta percha, which is also used to conceal the clasps.

The curative treatment is necessary whenever any complication attends the crack. If it is recent, antiphlogistics and rest should be first tried; cold bathing, blisters combined with hygienic treatment may then be sufficient. A single groove at the upper part of the crack, near the coronary band, is often sufficient, or the removal of a V shaped portion of hoof, extending more or less deeply according to the condition of the crack, care being observed to avoid the growth of vascular granulations between the edges of the crack. There are cases where it is not necessary to remove the segments of the hoof entirely down to the soft tissues, but only to thin them down and to apply over it a dressing of oakum, secured by several turns of roller bandages. In all cases a bar shoe must be applied to relieve the pressure on the quarter where the crack exists. This is principally recommended by Prevost, Girard and others.

If there are deep lesions of the sub-horny tissues, a piece of the wall must be removed, and the operation for radical cure be performed. It is an old operation, by which all diseased tissues are exposed. As little of hoof as possible is removed. In operating, two grooves will be made alongside and at some distance of the solution of continuity. The wall between is removed so as to expose the podophyllous tissues from the coronary band down to the sole, care being taken to avoid the tearing of the structure of the coronary band, and the diseased tissues are then removed. If the podophyllous tissue, it is excised with the sage knife; if the bone is carious, it is scraped with the drawing knife. The whole is then dressed up with a shoe having the toe thinned down, and extending somewhat beyond the border of the foot.

The cicatrization does not take place from the coronary band alone, but also from the horny secretions of the podophyllous tissues. The repair is then quite rapid. The first dressing is removed after eight or ten days, and if everything goes on well need not be changed more than once a week.

The animal is not to be put to work until the hoof has obtained a certain consistency.

The operation for quarter crack is similar, except that only one groove is required in front of the crack, the tissues being exposed as in the operation for the removal of the lateral cartilages of the foot.

CALK.

Synonym.—Kronentritt (German)—Atteinte (French).—Thus is called a contusion, with or without wound, that the animal receives on the coronet, from the shoe of another foot, or from a foreign body, or by another animal walking behind or alongside him.

The skin of that region is very thick, slightly extensible, not easily yielding to the inflammatory swelling; there is commonly sloughing and mortification of tissues, accompanied with violent pain. It is frequent in animals that forge, also in very young horses or those which are weak in the lumbar region, and which interfere and cut themselves in walking. This lesion is also very common in the districts where horses are shod with high calked shoes, when the wound resulting from it is made by the internal branch of the shoe, which lacerates the skin of the coronet. Horses shod to travel on ice are commonly affected with it; the injury being more or less serious according to the size and sharp condition of the calk.

Horses ridden in riding schools are often affected with it during the various evolutions of the *haute-ecole*.

It is called *single* when the wound is slight; *concealed* when the pain is great and continued, as in the case where it takes place on the tendon, near the heels or the quarters; *horny*, when the contusion has taken place on the wall or at the coronary band; *complicated*, when it is very serious and accompanied with other more severe lesions. It is always a horizontal wound or a tumor by contusion.

I. *Symptoms.*—It is ordinarily recognized by the wound or swelling which exists upon the parts. Often, the horse is lame, and the affected part warm and painful; sometimes the hairs are cut, the skin scratched or torn. There may be a slight bleeding at the seat of the wound. When the wall has received the con-

tusion, the vascular network underneath may become inflamed, and then pus is formed between the teguments and the hoof, which then become separated. Sometimes even the lateral fibro-cartilage of the foot becomes irritated and swollen and ulcerates, especially when the contusion has taken place on that part where the cartilage is; in this case the injury may be complicated with cartilaginous quittor.

In severe cases, one may recognize a *furuncular* calk, characterized by the mortification and sloughing of a portion of skin at the place where the contusion took place; it is the cutaneous quittor of old hippiatry, with formation of a core; this is always very painful, and the inflammation generally spreads underneath the wall. Bouley calls it *gangrenous* when there is unlimited similar mortification of the tissues; in this case the slough involves large portions of the skin. At times it may be called *phlegmonous*, when an abscess forms itself under the skin; then the coronet is warm, thick and inflamed, and the pain is extreme. Then if an incision be made through the dermis in its entire thickness, an abundant bleeding takes place, generally followed by the resolution of the disease; if there is already suppuration, it is at the same time immediately allowed to escape.

II. *Treatment*.—If the injury is slight or recent, whether with or without wound, very cold water and the removal of the cause by taking off the shoe, are sufficient to bring on a cure. But if the contusion has been great and deep, recovery is more difficult to obtain on account of the suppuration which will follow. Then the application of poultices is indicated; if there is formation of a core and mortification of tissues, poultices of honey are especially indicated; in case of phlegmon, the poultice must be warm, and then incisions and counter openings must be made for the escape of pus; afterwards dressings are made with oakum saturated with tepid wine or tincture of aloes.

When the calking is horny, the use of emollient topically is insufficient; an excellent way then is to obtain the required sloughing of the tissues by actual cauterization—the iron heated to white heat: by thus destroying a portion of the hoof and the soft tissues, one will avoid the excessive pressure at the coronary

band; this may also be prevented by the thinning down of the wall with the sage knife; but one must be careful not to remove too soon the portions of horn which may be detached.

When the calking takes place at the heel, it is good—so as to prevent other complications—to pare the foot down, especially at the heel, to remove the divided hoof and transform the wound to a simple one which can be dressed, as already stated, or with digestive ointment secured by several turns of a roller.

When there are wounds of the teguments, it sometimes happens, if the immediate union has not been obtained, that the portion of skin forming the inferior edge of the wound turns down and that the granulations protrude, tending to form a kind of fungoid growth. Chabert says that these must be cut off and dressed with oakum soaked in alcohol.

Calking at the hind feet being the most severe, and those which are followed by most serious complications, on account of the urine and droppings of the animal, which impregnate the wound, one can never be too particular in keeping them clean and dressing them well. When they end in cartilaginous quittor, they must be treated as that disease usually is.

As to the means of prevention, they consist in not placing the horses too close to each other in stables, fairs, &c., in not forcing them too much in their gait, in shoeing properly those which forge or interfere, and in placing or riding them in such a way as to avoid the possibility of their wounding each other.

PUNCTURED WOUND OF THE FOOT.

Synonym.—Naglebritt (German)—Nail in the foot (English)—Clou de rue (French).—In veterinary science this designation has been given to a punctured wound, often with laceration, sometimes with contusions, either at the sole or frog of the foot of the monodactyles, and produced by sharp or cutting bodies, most commonly nails, upon which the animal steps. The form of these bodies, the direction they take, the force with which they penetrate, and the part of the sole they enter, give rise to various lesions, of varying gravity as they are older or as the injured part enjoys a greater sensibility.

Etiology.—Nails, stumps of nails, are most often those which are picked up in the streets; at other times it is a metallic substance elongated and sharpened; again, there are pieces of glass, or other substances, such as bones or sharp stones, which are picked up and produce the wound.

It is principally in the streets of populous cities, in the yards of builders, or on the grounds where buildings are pulled down, that horses are mostly exposed to receive these injuries. In rural districts they are rare, comparatively, to what they are in cities.

It is evident that horses with wide, flat, thin, softened hoofs are more exposed than those which are of different structure.

I. *Divisions.*—Punctured wounds of the foot may be *simple* or *superficial*, *deep* or *penetrating*.

One of these bodies, piercing into the frog, requires to go in deep to be serious, as above the frog (which is itself quite thick, though formed by a soft and flexible horn) is the plantar cushion, a fibrous, soft and elastic mass, which offers a great resistance. If, however, the injuring body is a very long nail, which runs perpendicularly in through the frog at the plantar cushion, it may reach the terminal extremity of the perforans tendon, situated immediately under the plantar cushion, and penetrate the sesamoid sheath. It is known that this sheath forms a sac of some dimensions, that it extends above and below from the inferior half of the coronary to the semi-lunar crest, and in its transverse axis extends from one retrosal process to the other; the inferior portion of this synovial bursa covers the plantar aponeurosis in its whole extent. Sometimes, again, the puncturing body penetrates as far as the bone; sometimes the navicular; at others the os pedis, and sometimes even penetrates into the articulation.

II. *Symptoms.*—They vary according to the seat of the lesion, its depth, the mode of action of the penetrating body, length of time it has remained in the wound, and the nature of the lesions it has made; all conditions which may change the characters of the disease from a first degree, when the animal shows no evidence of pain, to the extreme point where its life is in danger, and even ends in death, by the excessive local alterations and the sufferings accompanying it.

Often the first point which assists in the diagnosis of the case is the *history*. The driver who has seen the horse become suddenly lame, has examined the foot and found a nail more or less deeply; at others, it is the surgeon who yet finds the nail in its hiding place. The exploration of the part shows with certainty the nature of the lesion, the direction and depth of the wound, as well as the physical condition of the body which has made it, and all circumstances which allow a positive diagnosis to be made.

Quite often the nail is no longer in the foot; sometimes it has left its mark—an opening which can be explored; often this is not visible at first sight, though the wound may be even deep; this is when the injury to the hoof has been very slight, and when the hoof has retracted on itself by its elasticity, or when the opening is concealed by the dirt of the streets. It must be remembered that sometimes the penetrating body remains broken in the soft tissues after its entrance through the hoof. If the accident is recent, only a little blood may be found—liquid or coagulated—over the wound; later, some serosity, more or less purulent, is observed; the pus is white or black, sometimes mixed with synovial fluid; sometimes there are granulations on the bodies of the wound which protrude over the edges, commonly called proud flesh. Such are the first objective symptoms obtained by the exploration of the parts. Ordinarily they are insufficient, for it is not always easy to probe the wound. It then becomes necessary at the beginning to pare off the hoof all round the wound, and sometimes to hollow it at the point of injury, without going to the sensitive structure, however. In this way the exploration and the probing of the wound are rendered much easier.

The pain, expressed by the lameness, is almost always manifested; it varies according to the seat of the lesion and its depth. At first the intensity of the lameness does not give the exact measure of the disease, and often one may be led into error by it; but it gives an exact value of the lesion when a few days have elapsed since the injury was received; if the pains are slight or absent, they indicate that the reparative process is going on well;

it is, on the contrary, interfered with by complications, when, as time goes on, the lameness increases instead of becoming diminished. Generally one can say that the inquiry will amount to nothing when the lameness is slight, while, on the contrary, serious complications must be always looked for when it is great and remains on long, even when the first lesion has been slight and superficial. The wound, which has penetrated through the hoof only, has no symptoms, no sequelæ; the animal is not lame from it, or if he be, the lameness is very slight, the foot resting entirely on the inferior surface; when the resting takes place only on the toe, ordinarily the tendon is injured, possibly the synovial sheath; in cases where high inflammation exists the pain is very great, the animal walking on three legs only.

The anatomical examination of the injured part teaches that the most serious punctured wound of the foot is that of the centre of the foot, where the tendon, synovial sac, and where the articulations may have been injured. Forward of this, the wound is less serious, even if it involves the bone. Posterior to it, it can only injure the plantar cushion. Under this condition the plantar region of the foot is divided into three zones: one, anterior, from the toe to the point of the frog, one, middle, extending from the first to the median lacunæ of the frog; and the third, posterior, covering the space left back of this to the heels.

The most serious of the injuries to which the foot is liable are those caused by foreign bodies which penetrate the middle zone, that being the most complicated portion of the structure. The symptoms will vary, according as the wound extends to the plantar aponeurosis, or only as far as this membrane; or lacerates the soft surrounding tissues without touching it; or it goes beyond this and injures the small sesamoid sheath, or even going deeper, severs the navicular bone, or its ligamentous attachment to the os pedis; or reaches the last phalangeal articulation.

A wound of the plantar aponeurosis is always very painful, especially when complicated with necrosis, in which case there is no weight put on the diseased leg, and continual lancinating pains and reacting fever are soon observed. The wound is then

fistulous in character, and the suppuration then flowing from it meets with difficulties in its escape, which gives rise to a state of general inflammation, and the foot becomes hot and very painful. If the necrosed scar becomes loose and sloughs off, being detached by suppuration, improvement soon ensues; but as the necrosis of the tendon has generally a tendency to spread, there is an increase in the character of the symptoms. If the wound extends to the sesamoid sheath from the start, the synovial fluid is observed escaping, first pure, but soon becoming milky and purulent in aspect, if the sheath has become inflamed, and easily coagulating in yellowish clots. The pain is then very great, much more so than when the aponeurosis alone is diseased. At times, by rapid closing of the plantar wound, or obstruction of the fistula, a warm swelling forms itself in the back of the coronet, which raises the skin by degrees and becomes elevated, prominent at one point, and giving a feeling of fluctuation. This swelling ends in ulceration, and allows the escape, sometimes, of an abundant synovial, purulent discharge.

The wound of the small sesamoid and of its ligament adds nothing to these series of symptoms. The probing of the tract will only determine it by the sensation of roughness which it will give; but generally one must be careful in using the probe, especially when the flow of synovia is absent. If the foreign body has pierced through the ligament, or has penetrated in the coffin joint, phalangeal arthritis is the consequence. The same result is likely to follow excessive inflammation of the foot and the macerating effect of the suppuration, in which case the tendon may soften down and give way. It may then also happen that this tendon retracts by the contraction of the muscular fibres, and can then be traced upwards to the back of the coronet, or of the fetlock, according as the giving way has taken place higher or lower.

With arthritis there is a hot, painful swelling of the whole coronet, with diffused œdema above the fetlock and the cannon, and extending upwards to the whole leg, complicating the lesion by lymphangitis and painful swelling of the lymphatic glands. Then subcutaneous abscesses are found round the coronet, with

gangrene of the tissues ; while again, there may be only an extensive fibro-plastic exudation, which ends in calcareous organization and anchylosis.

In the anterior zone, the only serious lesion met with is caries of the os pedis, characterized by great pain, continual lancination, loss of the use of the leg, and high reacting fever. There is abundant bloody and foetid suppuration, and the probe gives the sensation of the soft resistance of the bone, of its rough condition, and its partial fragility. The caries having most generally a progressive march, complications of separation of the hoof, to a varying extent, are often seen ; the pus arrives at the surface, between hairs and hoof : and diffused gangrenes are also often seen, which extend as well to the podophyllous as to the velvety tissues.

In the posterior zone, the only serious wounds are the lateral ones, which may injure the fibro-cartilage, and become complicated with their caries ; of quittor or fistula down to the lacunæ of the frog, as we have seen in suppurating corn.

Nails may penetrate the posterior zone through and through, coming out behind the coronet without danger. The sub-horny suppuration may detach the frog and be the only serious complication to be met with.

As *terminations* of all these injuries we may see resolution, suppuration, gangrene, softening of the tendons and phalangeal arthritis, and as *sequelæ*, bony tumors of the coronet, and anchylosis. The most serious complications are the dropping of the entire hoof, the rupture of the tendons, tendinous and cartilaginous quitters, for the injured foot, and chronic laminitis for the opposite one.

IV. *Prognosis*.—This varies according to the seat of the wound. Less serious in the posterior than in the anterior zone, it is less in the last than in the middle, where the region is so complicated and the nature of the tissues so different. The depth of the wound has also some influence on the prognosis. Wounds of the plantar aponeurosis are more dangerous than those of the plantar cushion ; those of the sesamoid sheath are more so than those of the aponeurosis ; they are still more serious if the bones are

affected; the worst of all is that of the joint. The direction of the foreign body and its simple or complicated action, will also influence the prognosis.

This, we have already said, can be established by the severity of the lameness. The nature of the foreign body must also be taken into consideration; if blunt, which crushes the tissues, it is more dangerous than if sharp and pointed. In a flat or convex foot, punctured wounds are more serious than in a well-made foot. They are less serious in heavy than in light draught horses, as the former, though they may remain lame, are still useful. The excitable condition of a patient will also alter the prognosis. Wounds of the anterior feet are more serious than those of the posterior.

V. *Treatment*.—In all cases, the first indication is to obtain a natural cicatrization and natural repair, always more rapid and perfect than that which is gained by surgical interference. This is generally easily secured, and for this reason it is important to avoid too severe manipulations upon the injured foot. One must watch the progress of the disease, give the foot as much rest as possible, remove the shoe, thin down in its whole extent the plantar hoof, so as to avoid any pressure, and keep the foot in a cooling bath—ordinary cold water, to which often is added acetate of lead, sulphate of iron, or common salt, very beneficially. Poultices cold, preferable to hot, give excellent results. By this treatment the progress of the inflammation is checked and very often deep and serious wounds, even those where the tendinous sheath has been injured, are easily cured. If the lameness gradually diminishes, the case rapidly gets well; at any rate by this treatment the inflammatory process is diminished, and the painful pressure of the hardened and thick hoof is avoided.

In the winter, when cold baths are of difficult application, chloroformed or carbolized compresses may be applied round the foot. The hoof is thus softened, and the pain reduced. At other times a blister is applied round the coronet.

If the lameness remains, or seems to increase, it is due to tendinous necrosis or caries, and it becomes necessary to operate. Must the surgeon then have recourse to an operation, and make

a simple wound with his sharp instrument? Or, is it still better to merely depend on natural resources, and assist them?

It is difficult to lay down any special rules. If the disease is old, if the necrosis has progressed and is still increasing, a serious operation becomes necessary. If the necrosis is recent, one must be guided by external indications. Notwithstanding, (Remault remarks,) one should not be too hasty, as the animal must necessarily be laid up for several months afterwards. It is often sufficient, in a recently punctured wound, in order to avoid complications, to modify the condition of the fibrous tissues in the whole extent of the lesion, by applying substances simply antiseptic, or still better, slightly caustic. Key employs the cold bath, in which he dissolves a pound of sulphate of copper for ten or fifteen quarts of water; by this means he has secured the speedy recovery of severe punctured wounds. For a long time, and with the same object, we have been using a mixture of equal parts of sulphate of copper and sulphate of iron, having first hollowed the foot downwards round the seat of the puncture, and the sole being pared down as thin as could be borne.

H. Bouley prefers the application of pulverized corrosive sublimate; after tracing the wound to its bottom, he fills it well with the powder. This remedy was already recommended by Solleysel, who used it in caries of the *os pedis*. Other practitioners prefer phenic acid, and claim for it great advantages. By the actions of the caustics upon the fibrous tissues exposed to necrosis, or already in that condition, a double salutary result is obtained; first, the transformation of the part, which is the seat of a progressing gangrene, into a chemical eschar; and, again, promoting the more active vascularization of the surrounding parts, and consequently their increased power of healthy reaction; conditions twice favorable to the sloughing of the eschar, and the process of repair following it.

When the wound has reached the *os pedis*, and this has become carious, a portion of the sole is removed, so that the supuration can escape, the bone is scraped off, and a dressing of carbolized alcohol applied, kept on by a thin shoe or slipper, with tin plates.

When there is a fistulous wound, through which synovia escapes, yet not purulent, caustics are recommended. Solleysel preferred these, but blacksmiths used them so carelessly that they soon were discarded. Since, however, they have been employed again, not in powder, but as trochiscus. Rey recommends the corrosive sublimate in conic pencils, introduced to the bottom of the fistula; by them he obtains an eschar, a solid clot, from the synovia, which closes up the wound and prevents the synovial flow, at the same time stimulating the granulations which close up the fistula.

We have already said that these measures must be used only when the synovia is not purulent, as then the escape of morbid liquids may be prevented. It is not then uncommon to see abscesses forming at the back of the coronet; generally not so serious as is usually believed; not as much as those which take place in front and which are due to suppuration of the articulation. After the running out of those abscesses, sometimes the wound of the foot assumes a better aspect, the symptoms improve, and the animal recovers rapidly. Injections of a very weak solution of tincture of iodine, as well as the baths of copper or iron, are then very advantageous. Hertwig advises the introduction of a seton through the sesanoid sheath.

This treatment is not always sufficient, especially where the lesions are deep. All the diseased structures must be then exposed, and they must be removed and the wound changed into a simple one, which well dressed, will heal without difficulty. The operation is required in proportion to the extent and nature of the lesion, and if this is recent, and comparatively superficial, if a piece of the foreign body yet remains in the wound, or if its removal has resulted in the sloughing of a small piece of dead tissue, it may be sufficient, the foot being pared thin, as already advised, to simply make an infundibuliform opening, various in size, so as to expose the bottom of the wound. For that purpose the drawing knife or the sage knife is used, a light shoe is put on, and a dressing of digestive ointment, ægyptiacum, or simply alcoholic mixtures, are kept on by plates. At times it is advantageous to assist the process of sloughing

by the use of caustics, sulphate of copper, Villate's solution, tincture of iodine, &c. If the wound is near or at the heels, the branches of the shoe are shortened and an appropriate dressing is put on. Subsequent dressings require the same care. Cicatrization goes on and the hoof soon returns to its normal condition. Sometimes the surgeon is called only when the inflammation is far advanced and suppuration already established. This peculiar condition is manifested by the swelling and heat of the parts, the acute pains, and often the high fever. The wound then must be at once enlarged and the pus allowed to escape, and this is the true operation for deep punctured wounds.

The operation becomes more serious if there is separation, partial or total, of the sole or frog, with a more or less advanced disorganization of the tissues underneath. If there is escape of purulent synovia, extensive cuttings are to be made.

In olden times, to perform the operation of the deep punctured wound, the entire removal of the sole was performed, without distinction or exception, and, notwithstanding the severe pains following it. In our days a portion of separated sole or frog only is taken off. This is done by slices and only so far as necessary for the other steps of the operation.

This operation is indicated when there is great pain, continuing without regard to what treatment has been followed. It is also when the plantar aponeurosis has assumed a greenish tint, diffused in its extent, without indication of a repairing process, with the marks of sloughing of the dead structure. The instruments required are various: sage knives, single and double; drawing knives of various sizes; a directory, bistouries and forceps.

The animal, properly secured, and placed under anæsthetics, if too irritable, (Bouley), the horny structures are removed wherever the suppuration has separated them from the soft tissues beneath, or the sole is only pared down thin, as well as the horny frog in its whole extent.

This first step of the operation completed, the operator introduces a directory into the whole tract of the fistula, and with a sharp sage knife a longitudinal incision is made, following the canulæ of the directory as a guide, above and below the fistulous

opening, and in the direction of the antero-posterior axis of the foot. This done, with the sage knife held in full hand, with one cut the surgeon, by a deep incision, removes the greatest thickness of the tissues all round the longitudinal cut he has just made, transforming the fistulous tract into a conical infundibulum, whose apex is at the bottom of the wound. If then the aponeurosis is not yet exposed, the operator removes with the forceps and bistoury whatever tissues still cover it.

Then follows the excision of the aponeurosis. This is measured by the extent of the necrosis. As a rule, it must reach a little beyond the diseased part, and by that operation the purulent synovia finds a free chance to escape.

If the sesamoid is sound, it must be left alone, but if the diathrodial surface is roughened, ulcerated and on the way to desquamation, it must be scraped off with the narrow and long drawing knife.

The complications of arthritis cannot be interfered with by the surgeon. It is by general antiphlogistic treatment, and by local and external applications that they must be treated.

The operation ended, the dressing follows, and becomes one of the most important parts of the means of recovery. As light a shoe as possible is placed on the foot, a coat of hoof ointment, Venice turpentine, or tar, is applied upon the thinned sole; pads of oakum wet with alcohol, carbolized or not, are then carefully laid on the soft parts.

Some practitioners cover them with *œgyptiacum*, (Mandel); others simply with Venice turpentine (Lafosse.)

The pads or balls of oakum must not be too thick or hard, as no pressure is needed. The whole dressing is retained by plates, and several circular straps of tape above the coronary band. Cold water baths are always good afterwards.

In the subsequent dressings one must bear in mind that the work of repair, the granulating, is more rapid in the tissues of the plantar cushion and fleshy sole than upon the bone and tendinous tissue; and that in this case it is longer than upon bone if this has been scraped. The result of this is a wound which presents various aspects in its progress of cicatization. It often

has a handsome granulating appearance over its entire surface, while at the bottom there may be a clot of coagulated synovia covering the surface of the sesamoid and the edges of the wound of the plantar aponeurosis. A free escape of synovia must always be facilitated, and often the development of the granulations has to be controlled. If the cicatrization proceeds well and regularly, dressings need be changed but seldom, being satisfied with the cold bath, with copper solutions.

Dressings can be made with tincture of myrrh or of aloes; sometimes in the center with tincture of iodine. At times caustics are again used, while at others fragments of bone or of tendon have to be excised.

The entire closing of such a wound may sometimes take place in a month; but often, even without complications, two and three are required. Complications may easily make their appearance and interfere with the cicatrization. Sometimes pieces of necrosed tissues which remain at the bottom of the wound give rise to fistulous tracts, until they are entirely removed. In this case, twice as long a time may be necessary to a cure. The pain and intensity of the lameness, after the operation, do not accurately indicate the nature of the disease; the general phlogosis, especially the synovial inflammation, always causes a special acute pain, which for from three to six weeks may prevent the animal from resting his foot on the ground. This pain is entirely independent of the process of repair, and must not alarm the veterinarian. While the reacting fever is absent, and there is a good appetite and no swelling in the region of the coronet, the progress may be considered satisfactory.

After the cicatrization of the plantar wound made during the operation, the parts may return to their physiological condition or nearly so; or, on the contrary, remain in an entirely abnormal condition. Often, indeed, the sesamoid sheath may become obliterated, the diarthrosidal surface has lost its smoothness and there is no more sliding upon it, the tendon having become united to it. The animal then remains lame, and cannot be utilized except in walking; if coronary ankylosis, ringbones are detected, and the application of firing is indicated. Sometimes neurotomy gives excellent results.

CONTRACTED HEELS—HOOF BOUND.

SYNONYM: *Zwanghuf*, German; *Encasleture*, French; *Incastellatura*, Italian; *Encatenadura*, Spanish.

This name has been given to a defect of the horse's foot, by which it becomes characterized by its general narrowness, more marked, however, in the posterior than the anterior part. It is especially marked by the diminution of the lateral diameter of the horny box, the deformity consisting in a greater or less contraction of the heels and of the quarters.

It is principally observed in the fore feet, and it is there only that it presents the characters we are about to describe. This is due to the fact that in the fore legs there is need of a certain expansibility in the posterior part of the foot, which, especially during the action of locomotion, receives the weight of the body; while the contraction of the hind feet, gives rise only to an ordinary form of lameness. Sometimes one of the anterior legs only is affected; sometimes both, and in this latter case, the alteration is usually greater in one foot than in the other. Some horses are also seen whose feet are contracted only on one, usually the inner side, while the other preserves its normal form and directions.

Sometimes "hoof-bound" is only a simple deformity, without lameness and without serious result. But in most cases, it constitutes a very serious affection, which renders many horses useless and almost without value. It is of more common occurrence than is generally admitted, and gives rise to many other affections of the foot. Cases of lameness treated as located in the shoulder, or as navicular disease, are very often nothing but the result of commencing contraction of the heels. True navicular arthritis and hoof-bound are closely related. Whether the disease of the sesamoid sheath, arising primitively brings on the subsequent contraction; whether the contraction already existing gives rise to the alteration of structure which constitutes the disease so named, cannot always be determined. Hoof-bound was known in old times, and the oldest hippiatrics have proposed means to cure it. Riders especially have studied it, because the

disease is most common in fine saddle horses, whose feet are small. It is frequent in Turkish and Spanish horses, and animals from the Pyrenean districts, but common horses are not exempt from it.

H. Bouley describes two forms of the disease, the *true* and the *pretended* or *false* contraction. In the first, the hoof is very narrow, sometimes even concave on its lateral face, to such an extent that its antero-posterior considerably exceeds its transverse diameter; while at the same time its wall is more vertical, and the heels considerably higher than normal, and the foot looks like that of a mule, of which this is recognized as the normal appearance. In the false contraction, there is merely a diminution of the transversal diameter of the horny box in its posterior parts, the foot being narrow and contracted at the heels only.

We prefer to recognize a *total* contraction where the whole foot is contracted, and is smaller than its fellow; *atrophied*, so to speak; consisting in a contraction *of the quarter*—when it is principally narrow in those quarters, the condition extending back to the heels—and a contraction *of the heels* when this is well marked from the quarters to the heels only. A *coronary* and a *plantar* contraction have also been designated, depending upon whether it occurs at the superior or inferior part of the foot, and there are cases where the contraction is *intermediate*, that is, in the middle of the foot only, while it has its normal size, both at the coronary band and at the plantar border. *Single* and *complicated* contractions have also been named. It is admitted that it may be *congenital*, though rare; most often, however, it is developed by itself, as a result of special causes.

I. *Symptoms*.—The physiognominal aspect of the hoof-bound foot is characteristic, and it is by this that we shall begin the symptomatology of the disease. When the disease is total, the complete general dimensions of the foot are observed to be smaller than would be required by the size of the animal affected; most frequently the hoof has an oval form, consequent upon the antero-posterior diameter exceeding the lateral, which is generally diminished. In the contraction of the quarters, the narrow condition of the foot is specially marked from the centre

of the quarters back to the heels. In contraction of the heels, the diminution is very marked from the centre of the quarters to the end of the heels, so that the two sides of the wall converge towards each other posteriorly in following a nearly straight line, instead of the circular appearance of the normal state, and the heels have principally lost their round appearance, and are elongated, and even pointed in appearance. The wall, in the regions where the contraction is more marked, that is, behind, is either perpendicular to the ground, or even oblique downwards and inwards, in such a way that the coronary circumference is greater than the plantar, and consequently it represents an inverted truncated cone.

The opposite form of contraction, that of the coronary, is seldom seen, and we may ignore it. The wall is irregularly rough and ramy, and without its shining appearance. The heels are generally high, nearly as high as the toe, though it is not so severely altered in cases where the heels only are contracted. As a consequence of the contraction of the plantar border of the wall, the sole seems to become folded in the direction of its antero-posterior axis, and it shows a much greater concavity on its internal face than in the normal state. This cavity is then filled by the frog, considerably reduced in size, thus presenting an idea of the severity of the contraction. Most frequently it is a thin, thready body, flattened on its sides by the closing of the bars; its branches, thin and narrow, resembling two bands so closely resting on each other, that the lacuna which separates them is no more than a narrow fissure, which will scarcely admit the introduction of the thin blade of a knife, and from the bottom of which escapes a sero-purulent, gray or blackish liquid; the lateral lacunæ being also transformed into two narrow and deep fissures, filled with the same fluid. The bars, generally high, assume a direction perpendicular to the ground, instead of being oblique, as in the normal state, from the centre of the foot towards its circumference.

In all the regions of the foot, but especially at the wall, the horn is so dry and hard that sharp implements cannot cut its cortical covering, while it is at the same time brittle, and hence nu-

merous superficial fissures appear at the quarters, and the outside and inside toes, the frog itself being hollowed by fissures upon its body and its branches. Sometimes it happens that the bars show deep fissures, running from above downwards, to the extremity of the lateral lacunæ, which are thus continued by a crack of the heel up to the skin of the coronary band. There is often a separation of the wall and the sole, the formation of what has been called a double wall, or false quarter. Quarter cracks are commonly met with it. Corns are frequently seen also in connection with it.

Whatever may be the form of the contraction, it is generally accompanied by pain, manifested by change of position while at rest and by lameness when in action.

If only on one side, the affected leg is carried forward, and thus relieved from the too painful pressure which would take place if it remained in a vertical direction under the centre of gravity. When both feet are diseased, the horse is constantly moving and balancing himself, pointing the legs alternately and sometimes stretching both legs forward, as in laminitis, but always moving, so as to push his bedding under him and away from his fore feet.

If the pain is slight, there is only a stiff gait, and the animal hesitates and stumbles easily. But if the disease is advanced the lameness is great and the animal is very groggy in his gait. He fears to rest on his heels, which without being a peculiar characteristic is a symptom which presents, however, a particularly noticeable condition. While there is hesitation in the action of resting, there is difficulty in that of the shoulder. This is principally observable when the disease affects both feet. The shoulders then seem to be fixed to the trunk, and their motion forward is very limited. The symptoms are mostly more marked when the animal leaves the stable. It may then happen that the pain temporarily losing somewhat of its intensity as the horse is moved, the shoulders become more free, the liberty of action returns, and once warmed up, the animal may offer a totally different appearance from that when first leaving the stable. But as soon as they become rested, the pain returns as severely

as before, if not more so, and with it the same exhibition of symptoms.

The examination of the unshod foot while it is warm, shows the extreme sensibility of the heels. The foot being pared, generally one may observe, in the region where the contraction is most marked, yellowish or reddish discolorations, evidences of the bruises in the living parts, as well as of the serous or bloody exudations which have taken place on their surfaces. These indications are especially abundant on the level of the sole and wall. If the contraction is old, there is at that point a pulverulent mass which when removed, leaves a cavity which sometimes extends upwards under the quarters. It is a separation of the wall, of two or three centimeters in depth.

An important observation for hoof-bound, and which assists in its recognition, is the increased wear upon the shoes at the toe, which takes place not only when animals are working, but also while idle in the stable as the result of pointing and scraping the stable floor. The horse which has both feet diseased is constantly in motion, to such an extent that his shoes are entirely worn in a few days.

At times the pain is so great that it gives rise to general symptoms; the animal becomes anxious, loses his appetite, refuses his food, lies down most of the time, and rises only with difficulty.

II. *Complications*.—We have already seen that *quarter cracks* and *dry corns* are common affections of contracted feet. Exostosis of the phalangeal region is also commonly met in such feet, especially side-bones. Knuckling, and diseases of the tendons and of their sheaths are also often caused by contractions of the feet. The rest of the foot on its whole surface is thus perverted and the tendons become retracted, painful and swollen.

Navicular disease is so often met with in company with contracted feet, that one disease is frequently mistaken for the other.

Laminitis has been said to be also one of the complications; if so, it is at least, quite rare in its occurrence.

Tetanus has sometimes been observed among its associations,

and Hartman attributes the development of so-called idiopathic cases of that disease, to this condition of the feet.

The emaciation of the affected leg is a complication seen also, with other forms of lameness.

III. *Pathological Anatomy*.—We have indicated the external changes of the hoof. The tissues that have been long enclosed in the contracted foot become atrophied; molecular changes do not take place as in the normal state; they become changed in aspect, composition and properties; they become denser and more compact, and are no more able to fulfil, to the same extent, their physiological functions.

The plantar cushion is so completely pressed upon itself that the stratified structure of its fibrous layers can scarcely be distinguished, and the presence in the interstices of the yellow fibrous substance is with difficulty observed. It forms only a homogeneous mass, whitish in color, resisting in consistency, and lardaceous in aspect. The dilated bulbs which are above the cushion are also considerably diminished in size, and present, when cut through, a uniform white color, its composing substance being reduced to a single inelastic mass.

The ungual phalanx becomes deformed by degress, loses its circular shape and becomes of an elongated oval form. Its lateral faces assume a perpendicular direction; its structure is modified; its substance becomes more compact, and the small vascular openings are obliterated, while the largest are increased in size. Its work of obliteration is specially observable at the patilobe eminences, which seem to be crushed. The lateral cartilages are also much compressed, condensed and modified in their structure.

The navicular bone is also compressed, the sheath and its support not allowing the easy play of the tendons, and it is in this way that navicular disease may follow hoof bound. But there is a specially noticeable modification in the keratogenous apparatus, which, as a consequence of the arterial obliterations, fails to receive freely and actively the necessary amount of blood. The horny secretion proper to the podophyllous tissue, the white or soft horn, is reduced; the podophyllous tissue itself is atro-

phied; its lamellæ are less prominent and their separations are diminished in depth; the adherence of the podophyllous or keraphyllous tissues still exists where the circulation of the blood is not interrupted, but beyond, they are easily separated and often present deep excavations towards the sole.

If hoof bound advances slowly, the same atrophy of the sub-horny tissues takes place. Then, however, it proceeds by degrees, the tissues accommodating themselves in size to the gradually diminishing dimensions of the cavity where they are contained, and there is an equal proportion between the size of the hoof and the volume of the tissues enclosed in it. These being less compressed, there is less pain. In this manner an excessive contraction of the heels may sometimes exist without marked lameness.

IV. *Prognosis*.—This is the more serious as the disease is more developed. Total hoof bound is excessively tenacious, and resists the best curative measures, though if there is only a slight contraction at the heels, it is generally amenable to judicious treatment. The duration of the disease is an important factor in the question of the success of the treatment, as the condition of the os coronæ, os pedis, navicular bone, sesamoid sheath, plantar cushion and the atrophy of the kerotogenous membranes have all to be taken into consideration.

The age of the diseased animal and any existing complications are, of course, circumstances which influence the prognosis in an important degree.

V. *Etiology*.—Hoof bound, says H. Bouley, is not a simple fact, produced by a unique cause acting always in the same manner; it is, on the contrary, a very complex one, to the production of which a great number of causes of various character and intensity contribute with simultaneous or successive effects.

The hygrometric condition of the horny substance is a principal feature in the etiology of the disease. It is when the hoof loses by evaporation the moisture which it should contain that it contracts as all organic substances do, and its flexibility returns when by a sufficiently long immersion in a liquid, the moisture that it has lost is recovered. Observation proves that this dis-

case often finds the conditions of its presence in circumstances which induce dryness in the part. In such cases the foot has the property of retracting, to an extreme degree, especially towards its posterior extremity, where the frog is situated, constituted as it is of a softer and more depressible substance than that of the wall. The same phenomenon takes place in the living structure that is observed upon the hoofs of dead feet; a phenomenon which cannot even be prevented by filling their cavity with plaster. During life the hoof is constantly permeated by a current of fluids which penetrate it from its depth to the surface. It is the serous fluid that the hoof is continually absorbing by the hygroscopic properties common in living tissues, which counterbalance the tendency of the foot to retract upon itself and keep it in the dimensions required for the perfect reception of the parts it covers. So long as the equilibrium is preserved between the loss of this fluid by evaporation and its renewal through the perspiration of the keratogenous apparatus, the hoof preserves its physiological form; but if this equilibrium is destroyed by an excess of the loss, then the condition occurs for the retraction of the hoof and the infliction upon the parts underneath of an excessive and painful pressure.

This explains why, as proved by observation, lameness in general and that of contracted heels especially, is more frequent in warm than in moist seasons. Long standing in the stable is also an efficient producing cause. The feet become dry upon a constantly dry bedding, and here also the influence of inaction must be taken into account. The disease is commonly found in stabulation, but seldom when the animal is in pasture; and when it has existed it often disappears in the latter circumstances.

The alternation of dampness and dryness also influences perhaps more the genesis of the disease than dryness alone. A foot too much impregnated with dampness, which is afterwards left to the air, becomes harder than a normal one placed in the same conditions. It retracts easier also. It is probable that the water, in softening the superficial layers of the wall, also renders the evaporation of the liquids of its deep parts more active. In the ordinary condition of the foot, the evaporation is diminished by the impermeability of the external hoof, which it owes to its den-

sity; but where this hoof is softened by maceration, its fibres, partly disintegrated by the dissolution of the glutinous substance which keeps them as a compact mass, allow the air to penetrate in their interspaces; air which dries them to a certain depth; hence a proportionate movement of retraction of the entire hoof upon itself. This evil effect of an excess of moisture explains how it is that poultices or other moist applications which horse attendants abuse so frequently, may give rise to results entirely opposite to the one in view, and why the hoof becomes dry and brittle, if not contracted. These topical applications take off from the cortical layer of the foot its protecting varnish, and expose it to lose its water of growth.

Some of the practices in shoeing contribute also to the desiccation of the hoof; such is principally that which consists in rasping the wall from the coronary band to the plantar border; as also the too long continued contact of a hot shoe with the foot. Shoeing itself promotes the same result, as, protected by a shoe, the foot no longer wears normally and grows beyond normal limits. The mass of hoof, which, in the process of growth, has gone beyond the inferior limits of the podophyllous fissures, is no longer in contact with the living parts beneath, and they cease to be impregnated by the fluids which are thus constantly allowed to evaporate. It then dries up by evaporation and becomes hard, and retracts upon itself in such a manner that the circumference of the foot in the lateral diameter diminishes more or less, especially posteriorly, and thus forces the incurvations of the sole and of the bars (H. Bouley). If a horse remains shod for several months without having his feet trimmed and pared by the blacksmith, these are seen contracting by degrees, as they increase in length, and soon assume the aspect of hoof-bound.

But these are not the only effects of shoeing in the etiology of contraction. On the contrary, this practice is the most common cause of this lesion of the hoof, if not practiced with the intelligence it requires. We have said, in speaking of corns, that they were proofs of bad shoeing. The same might be said of the contraction. Moreover, corns generally indicate great errors in shoeing, while hoof-bound demonstrates the ignorance of the physiology of the hoof, which in action must enjoy the

necessary elasticity to relieve the contact with the weight of the body upon the ground. No doubt the theory of Bredey Clark exaggerates the degree of elasticity in admitting a great power of dilatation of the hoof, but it is an opposite excess to deny it entirely. The dilatation of the hoof, though limited, is evident at the heels; especially on feet which have never been shod (Merche.) There is especially in the inside of the foot, in the soft and supple parts, a certain compressibility of the hoof, which is often overlooked, and which is interfered with by a too narrow or unmethodical shoeing.

The external dilatation of the hoof is comparatively limited, but on the inside of the hoof there is, in the posterior part of the foot, (especially in the fore feet) a movement downwards and outwards of the os pedis, for whether the normal elasticity of the hoof is necessary, either by the physical and physiological constitution or the arrangement of the constituent parts of the hoof. Quite often then, shoeing, especially if too tight, resists the internal pressure. Even admitting that the dilatation of the heel is normal, shoeing which would prevent it would always produce, at the time of rest, a pressure upon the hoof which would limit the compressibility of the deep, soft tissues. The frog especially, formed of a softer horn, and placed under the plantar cushion, must receive this gradual pressure, which diminishes by degrees as the hoof becomes harder, and is reduced considerably as it reaches the external horny layers.

The errors committed in shoeing, and which predispose to hoof-bound, vary. The first is the manner in which the foot is pared; too often the heels are lowered to excess, while the toe is allowed to remain too long; too often, again, the bars are hollowed too deeply, thinned too much, as well as the frog. The wall then tends to retreat, as it is no longer protected behind. In reducing the height of the heels, in opening them, the tendency to contraction is increased; the thinned hoof dries up, the lowered heels lose their strength, and the bars are unable to perform their functions. •

A vicious adjustment also contributes to contraction. When the shoe is so prepared that its upper face is concave, and its branches form a plane inclined from without inwards, and when

this face extends back to the heels, there is a circular pressure produced upon the inferior border of the wall. This is a case in which the foot has a tendency to drop, pressed in as it also is by the weight of the body as the foot rests on the ground.

Another wrong practice is to place the nails too near the heels. The fixing of the shoe on the foot tends always to produce contraction, as Bredey Clark observed; it especially prevents the widening of the hoof, as remarked by Rodet and Coleman. But this effect of the nails is well marked at the heels, where they prevent the dilatation of that part of the foot.

These effects of shoeing are to be observed so much the more rapidly and seriously when the hoof is thicker, denser, and of a finer structure, as it is observed in small feet. In these feet, the hoof grows more rapidly, and is on this account more ready to contract. Let us now consider that this effect of shoeing is permanent, and that to that effect of a first shoeing comes to be added that of a second, of a third, and so on, and we can readily understand how truly the great number of contracted heels one may meet with can be attributed to erroneous shoeing.

Inaction is also an important cause, as, says Turner, the horse is by nature destined to be always in motion; it is a condition of its health, and it is on account of this condition that in the state of nature, he is free from contracted heels. It is, on the contrary, because the domesticated horse is confined within a stall for hours and days, that his feet become contracted. We have seen colts raised without exercise, whose feet were contracted before they were shod.

Contraction of the heels is often the result of other diseases of the hoof, and of other lameness. It is commonly associated with corns, navicular disease, punctured wounds of the plantar region, accompanied with long sensitiveness of the posterior parts of the foot; after diseases of the frog; thrushes; side bones; phalangeal articular diseases; in fact, after all affections of long standing, even if they have their seat in the upper segment of the frog.

Finally, heredity has been named as one of the causes. This cannot be denied as to some breeds, principally of meridional climates, as a consequence of the organization of their feet,

which are usually small. The proposition has, however, we believe, been exaggerated. This is proved by the Arabian horse, which, though accused of the vicious conformation from heredity, has according to Vallou, Crompton, and others, the most admirable conformation of his feet, when it has not been shod. It is broad, with good heels, neither too high nor too low, well open, well prominent, wide frog, the external wall being strong and well developed. In horses of Caramania, Anatolia, Syria, and those of the Arabs, which are constantly in the desert, from Bagdad and Bassora to the Gulf of Persia, the foot is handsomely made, and free from contractions when it has been exempted from shoeing.

VI. *Treatment*.—Prophylaxy plays an important part in the treatment of this disease. It is easier, and especially more rational, to prevent than to cure it when once established.

One of the first indications is to prevent the drying of the hoof, to effect which baths and poultices have been commonly used—the latter formed of cow manure, of clay, etc.—or by the application of greasy substances, in order to diminish the evaporation of the water of the hoof. Some practitioners are accustomed to use tar and various hoof ointments. The number of preparations brought into use is considerable, and in respect to some of these, the secret of which has been kept by the inventors, the effects have been entirely different, and the hoof, instead of preserving its natural good condition, has been altered in its qualities. “It is not with ointment,” says Hartmann, “that the hoof injured by the blacksmith can be repaired. It is by good shoeing, and never otherwise. The workman, to excuse himself, attributes to the quality of the hoof the origin of the mischief he has done.” Hoof ointment never gives to the hoof its natural polish, but many ointments, by becoming rancid, take off that which the blacksmith has left. The irritating ingredients which compose them sometimes produce the same results. This does not mean that a reasonable application of ointment is not necessary; but to act favorably it is essential that one coat should be carefully removed before the application of another. Otherwise, the new will fail of its proper effect, and on the contrary, the old coat, by

its alteration, will give rise to a deterioration of the hoof, especially in affecting the substance which unites the horny elements, and would reduce it to fine powder. And, again, ordinarily it is only the wall which is greased, the hoof of the sole and of the frog being left without, though they may be in equal need of it. The best hoof ointment is made of lard, a small quantity of wax or turpentine, sometimes mixed with tar. Glycerine is very useful, to give the hoof suppleness when it has become hard; it is applied by friction, after the foot has been well washed and dried. In the majority of cases it is preferable to poultices, to mucilaginous baths, or to keratophylous ointments.

Greasing is necessary for horses which are much exposed to dampness, and is as good for the sole and frog as for the wall. It is applicable, also, to feet which have to stand on dry bedding. Feet which, on account of diseased conditions, require to be frequently soaked or poulticed, ought also be greased. Bedding of fine sand and of sawdust has been recommended. It is well, also, to place horses upon marshy lands. All these measures may be advantageous if the feet are properly shod.

Good shoeing is the essential prophylaxy of hoof-bound; we must avoid all improper practices likely to promote desiccation and contraction of the foot, such as abuse of the rasp; too long application of the heated shoe when fitting it to the foot; the lowering of the heels; the excessive paring of the frog or of the bars; the bad fitting of the shoe; useless caulks; too many nails in the quarter or near the heels—all these errors must be carefully avoided. The foot, moreover, must not be allowed to grow too long. The shoeing should be renewed at least monthly, even if the shoe is not worn. And lastly, the horse must not be allowed too long periods of inactivity.

It has been proposed to abolish the custom of shoeing, but in the present conditions and modes of using the horse this is impossible. The feet, deprived of their accustomed protection, would soon become painful, and only by keeping the animal in the country could the feet be suffered to remain unshod.

Several modes of shoeing have been invented to prevent contractions in feet which are predisposed to them. Some are un-

doubtedly beneficial, but they must be used as an ordinary shoeing, and not reserved until the access of the disease. Good ordinary shoeing is often all that is required, but no doubt better and quicker results will be obtained by the shoe with short branches, with the flat shoe, or with the Charlier shoe.

The *half shoe*, the *shoe with short branches (fer a croissant)*, originally recommended by Cesar Fiaschi, then by Solleysel, Lafosse, Sr., and Crompton, is an ordinary shoe, made light, with very short branches (fig. 7), which when put on protects the toe, the

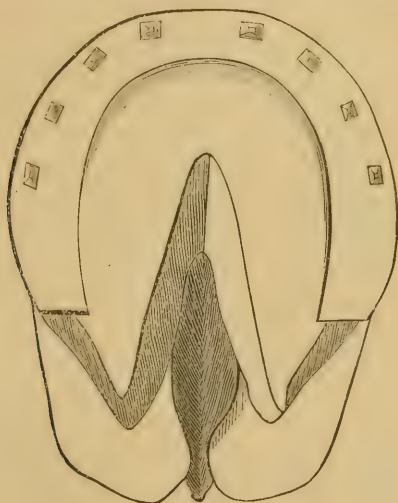


Fig. 7.

mammæ (outside or inside toe), and the anterior parts of the quarter in such a manner that the parts posterior to these remain uncovered, and rest directly on the ground. Thus shod, the shoe is almost in its natural condition; it rests on the ground by its posterior part, and the heels are made to contribute to the movement of expansion of the elastic parts of the foot. This shoe then, has real advantages, if the posterior part of the foot is yet normal, but if the heels are low and the frog atrophied, it ceases to be of service.

The *flat shoe*, or the *shoe with base (fer a siege)*, first recommended by Osmer, Morcroft, and more recently by Miles, Einsiedel and Hartmann, is the style generally adopted at the present

time in Saxony, and in various parts of Germany, as well as in England. In France it has found its way through the benefits observed by a few veterinarians. It is a shoe almost equal in thickness to its width, square, so to speak, but as light as possible; the internal border of the foot surface being hollowed or dished in order not to come in contact with the sole, while the part which rests on the plantar border of the wall is perfectly flat and horizontal. The heel portion is rounded, and covers mostly the heels of the foot where the borders of the shoe become perfectly adapted to the borders of the wall, to the remotest part of the heels, and preserves the same contour until it reaches the frog. The shoe nowhere projects beyond the border of the wall; it is only towards the toe that it is slightly raised, and has a small clip. The groove of the English shoe renders its application better than the peculiar nail holes of the French. Five or six nails are usually sufficient. This shoe allows the dilatation of the foot in all its limits, and while protecting the heels, does not predispose to their contraction. For its application, the plantar border only needs paring. That of the sole, the frog and the bars must be carefully avoided.

For the *shoeing of Charlier*, or *peri-plantar* (fig. 8 and 9), only



Fig. 8.

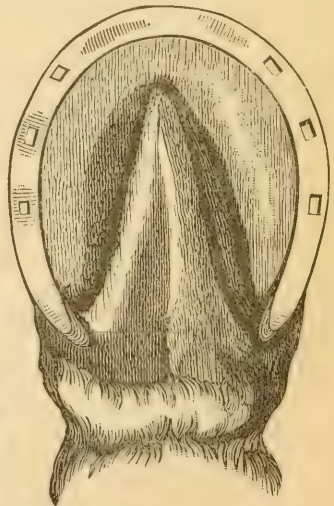


Fig. 9.

the part of the hoof which is most exposed is protected. It preserves entirely all the other parts of the plantar surface in such a way that, as in the conditions of nature, it is only by the fact of the wearing of the shoe that the excess of hoof is gradually removed. The foot shod by this process is provided at its inferior border with a metallic bar, often greater in thickness than in width, lodged in a groove made exclusively in the wall. This bar adapts itself in its internal circumference to the contour of the sole, which projects beyond the border of the groove, because all its thickness has been preserved as well as that of the frog and of the bars. In this way the rest of the foot receives its adjustment from the shoe itself, and by the regions of the plantar surface which it surrounds. This result does not, however, take place immediately, or when the foot is recently shod; but by degrees and as the shoe wears out, the time arrives when the horse walks both on his shoe and the sole of his foot. Owing to the general equalization of the friction, any partial wear is thus diminished, and the important result is secured, of reducing the weight of the shoe without the necessity of too frequent renewals, experience having proved that for the fore feet it is quite as durable as the ordinary shoe of twice its weight, but which from the manner in which it is applied suffers, unaided, the effects of the pressure and friction. (II. Bouley.) As in the action of paring the foot only the projecting portions of the wall at the inferior border are removed, the preserved parts of the plantar region resist the movement of retraction, and thus prevent its occurrence in a transverse direction. Again, as the thickness of the Charlier shoe is greater than its width, it possesses a certain elasticity and adapts itself to the successive movements of the dilatation and contraction of the horny box, however limited they may be.

We may now refer to some special modes of shoeing, recommended as preventive of contracted heels, but which seem to us to possess inferior advantages to the preceding. We first find the *unilateral shoe* of Turner, which, according to that veterinarian, relieves the foot from pressure upon the heels by placing the nail holes on the toe and the external branch only. Turner recommends also the conservation of the frog and that of the

bars, and it is probably to this that the success he has obtained by that mode of shoeing is due.

Coleman recommended a shoe very thick at the toe and thin at the heels, the toe being three times as thick as the heels. This veterinarian thought that by this shoe the animal was obliged to rest on his frog; at the same time the nails were driven in the toe principally, so as to allow the dilatation of the heels. This shoe has no real advantages, and predisposes to corns.

The *bar shoe* is of some utility when the frog is well developed, by placing on that part the pressure of the foot, and leaving the heels free. But it often fails in contracted heels, because in applying it these parts require to be pared down, in order to increase the prominence of the frog, and a condition is thus produced which does not exist in contracted feet. The same may be said of the *Charlier bar shoe*. The objections stated and the reasons suggested are true of all the various shoes designed to adjust the frog-pressure.

The *hinge-shoe* or *articulated* (fig. 10 and 11) of Bray, Clark, and

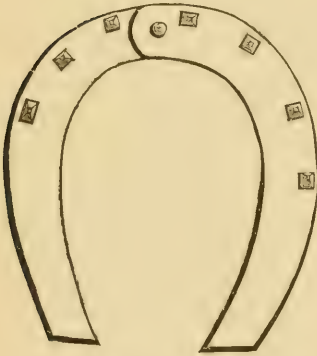


Fig. 10.

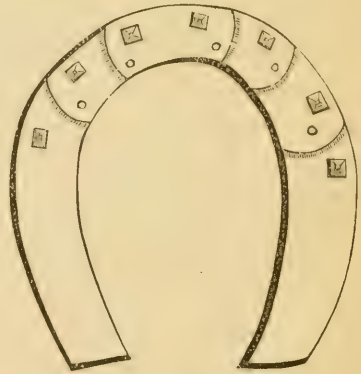


Fig. 11.

Vatel, and the *half-shoe* of Sempastous, of Peillard, also possess but a doubtful utility. Practice has not confirmed the hopes of their inventors. They are difficult to make, easily injured, and of small solidity, and their advantages are wholly of the problematic order.

Mayer has recommended a shoe whose internal border is

thicker than the external, in such a way that the plane of the plantar surface of the shoe shall be inclined outwards, and instead of the concavity of the ordinary shoe, where the foot is pressed when in a position of rest, there is a convexity which promotes and even increases the dilatation of the foot. This mode of shoeing has for its inconvenience the exposure of the sole to contusions. It supposes an extensive expansion of the foot which is not natural; the horizontal plane is amply sufficient in ordinary circumstances. We have, however, used it advantageously in preventing the pressure of the sole against the shoe by means of a sheet of gutta percha. We have used it in almost complete contraction, and we think we have noticed, with Hartmann, that the dilatation once started by a mechanical means, not too severely applied, nature continues it, with the assistance of that style of shoe. Instead of giving that special shape of the shoe in its entire length, it has been proposed to have it only at the branches; each heel presenting at its internal border a thickness, double or even treble that of the external, by which the shoe is inclined outwards by its plantar and becomes horizontal by the ground face. It is flat at the toe and the quarters, and is the shoe with *slippers* of de la Broue, of Solleysel (fig. 12), and that

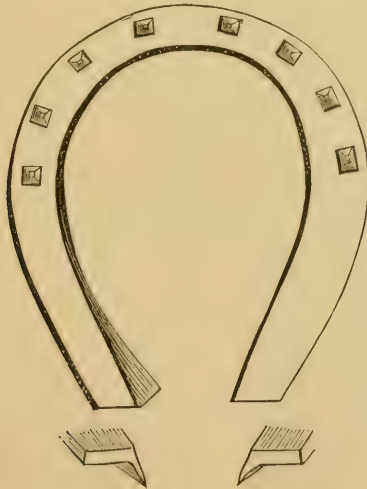


Fig. 12.

recently Vatin has used in proposing to have the internal half of the width of the shoe inclined. It thus resembles the shoe *genêté* or *with ears*, of which we shall speak hereafter. This shoe is only indicated when the heels are already contracted; they have no indication as prophylactic shoeing.

The shoe with slippers is indeed a shoe which in some cases may cure contraction. "If the results obtained have not been very satisfactory," says Defays, "this depends not upon the shoe, but arises from the defective manner in which the foot was pared. To be efficacious in that shoeing the heels must be left alone, and the sole and the bars must be well thinned. It is true that in this way the foot is in the most favorable condition for contraction, but the circulation is rendered easier in the tissues underneath, and the effects of the thinning of the hoof are diminished by the resistance opposed to the contraction by the inclined planes of the branches of the slipper. The same may be said of the shoe of de Belleville, also recommended by Solleysel, and for whose applications the foot has to be carefully pared. We feel assured of the propriety of recommending the use of the inclined plane of the branches of the shoe, with the presence of a small clip on the inner borders of the heels, such as proposed by Watrin.

Attempts have been made to dilate the contracted foot and to cause its return to its normal dimensions by mechanical means. The *shoe with ears* (fig. 13) has been devised for this purpose.

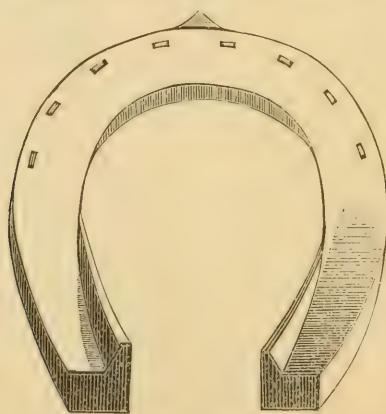


Fig. 13.

This is a shoe provided on the inner border of each heel with an oblique, blunt, sometimes perpendicular *clip*, resting upon the bars, which have been previously hollowed out for its reception, the design of which is to resist the return of the hoof which has been dilated, to its former contracted condition. Ruinien had spoken of this shoe as early as 1618. It was put on, after the dilatation of the hoof with the farrier's nippers, applied on each side of the quarter, the sole being entirely removed. In our days this operation of removing the sole is considered useless, and instead of the nippers of the farrier, dilators are used, under the name of *spreaders* (Desencasteleur). The oldest known form is that of Jarrier (fig. 14). This is composed of two curved

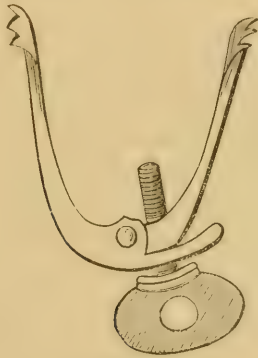


Fig. 14.

branches, 11 centimetres in length, articulated at one of their extremities like the ordinary compass, at which point there is a screw of peculiar form by which the branches are closed or opened at will, the other extremity having a strong claw projecting outwards. These claws are applied inside of the bars, towards the heels, which are previously thinned out, and by manipulating the screw the hoof is dilated to the extent desired. The shoe is then used like an ordinary one, both heels being armed with a clip on the internal border, the clips resting on the heels of the foot, which have been first opened with the drawing knife. This mode of treatment proved successful with Lafosse and others who experimented with it at the Saumur school. Under various experiments, the *Desencasteleur* has changed its form. Thus, Lafosse has arranged the two branches to run separately upon a

transversal rod like an ordinary vice, in which form the branches are shorter, and more power is obtained (fig. 15). There are

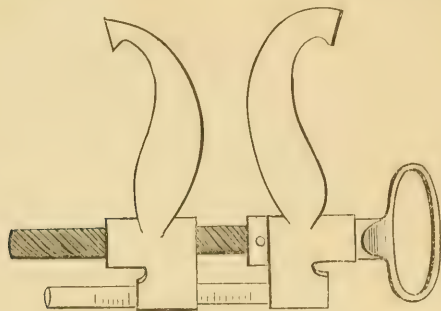


Fig. 15.

many other improvements which we cannot mention for lack of space.

Instead of applying the dilatation upon the hoof, and afterwards using a shoe which is closely adapted to the dilatation thus obtained, spreading shoes have been used. In the method of Jarrier, the shoe has to maintain the hoof in the condition of dilatation which has been accomplished by the instruments of expansion. It is a very delicate and difficult operation, so far as the proper dilatation of the foot is concerned, requiring the closest adaptation between the clips of the shoe and the parts of the wall upon which they rest. An error of a few millimetres only is sufficient to defeat the desired result; and the shoe, moreover, must be taken off at each operation. To avoid this, special shoes, which would act also as dilators, were invented. It was not, however, a new idea; Lagueriniere had as early as 1733 prepared a shoe composed of three pieces—one median, corresponding to the toe, and two laterals, in connection with the quarters; these latter are respectively articulated with the first, and have each three nail-holes. When this shoe was fixed upon a foot, whether unsoled or not, its branches were spread apart by a plate left in place, and by increasing by degrees the length of the plate, a gradual and increasing dilatation of the hoof was obtained. Gaspard Sannier improved upon this shoe by placing on the internal border of the branches, cranks, with a plate placed

crosswise and resting upon them (fig. 16). The objection to this shoe is that it cannot remain on the foot except when the animal

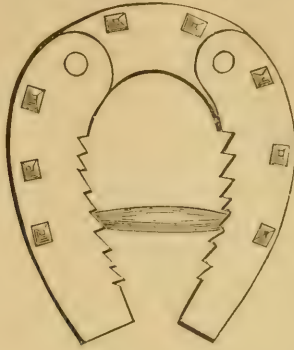


Fig. 16.

is at rest, as when he is at work it soon becomes loosened; besides which it is difficult to make properly.

Rolland has contrived an articulated shoe, in three pieces, the two lateral pieces being kept apart by double steel springs, which press upon them from the toe on their internal border, and thus effect the desired dilatation. Hatin has a simpler shoe (fig. 17).

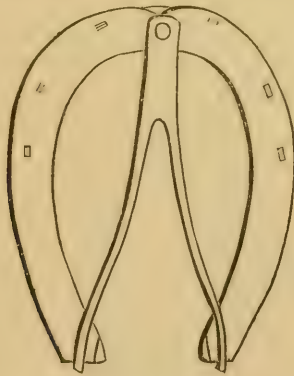


Fig. 17.

It is a light shoe, with nail-holes distant from the heels, and provided on the internal border with a small clip upon which rests a V spring, fixed by its point upon the toe of the shoe. The branches of the spring lodge in the hollows of the sole and of the frog, and press upon the shoe, and thus produce a slow dilatation.

Steinhoff has also invented a shoe with springs. It has recently been proposed to obtain the dilatation by means of a strong sole of cautchoue, placed between the shoe and the foot, leaving the frog full ; very thin where it rests upon the shoe and the foot, and becoming thicker towards the inner border of the shoe, which it overlaps. First it rests in the groove of the bars, and then protrudes upon the flat of the shoe, and bears on the ground at the time of rest. This elastic mass, compressed at the moment of contact, slightly dilates the shoe, which is articulated, or, what is better, very narrow at the toe, and square ; the heels also are thus slowly and gradually dilated.

Goodwin also has invented a very ingenious, but too complicated shoe, composed of three articulated pieces. From the centre of the median piece a prolongation of iron extends to the back of the frog, and is of sufficient thickness to be perforated, the hole having a thread through which a screw is introduced, running on each side. The branches of the shoe have three nail-holes, and from the inner border of the heel rises a clip so turned as to rest on the origin of the bar. The mechanism of the shoe is easy to understand, each branch being opened by the play of the screw which passes through the prolongation of the median piece, one extremity of which rests upon this prolongation, while the other presses upon the inner border of the movable branch.

The Goodwin shoe has been essentially improved by Fouris (fig. 18). It is a bar shoe, the bar being thicker than the rest of

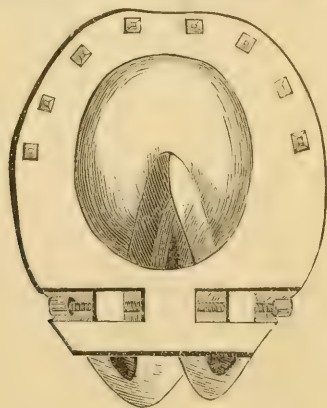


Fig. 18.

the shoe, and wider than the ordinary bar shoe. The bar is notched on each side, and through each notch runs a thread or vice which holds a movable clip, which is made to rest on the inside of the bars, which are first properly thinned out. By a motion of the clip through the thread, the heels are dilated slowly and by degrees. This shoe, however, is very expensive, difficult to make, and easily put out of order.

In all these methods of dilatation the shoe has to be made of several pieces, and in this condition is found a constant cause of weakness and of rapid deterioration, for which reason they are not very practicable. It is not so with the system used by Defays, Sr., by which the shoe, besides containing the essential elements of the desired mechanical dilatation, is left entire to fulfil the functions of the ordinary shoe, as well. That which characterizes Defays' method, who had used it in 1829, but which was made known only in later years, is that the shoe itself, which, by its ductility in action, becomes the agent of the dilatation of the hoof, becomes also, by its natural tenacity, the obstacle to the return of the foot to its former contracted condition, when once it has yielded to the outward motion which it has acquired. Defays uses an ordinary shoe, thick and narrow, and then further narrowed at the toe, if it is to be used on a foot regularly contracted. When it is thus affected, at five or six centimetres of the heels; if the contraction exists at the quarters, at the end of each branch. This shoe carries on the inside border a strong, resisting clip, made at right angles, to rest on the internal border of the wall of the heels. The shoe is flat, grooved like an English shoe, with nail holes slightly turned inwards; the last nail hole made as far as possible from the heels. It is made of the best quality of iron, in order to resist, when cold, the greatest amount of forced spreading by the dilator: it is the *expansive slipper* of Defays (*pantoufle expansive*).

The foot upon which this slipper is to be fixed must have both heels pared evenly, the sole and the bars pared down to a spring, and the hoof round the frog, on each side, thinned down as much as can be borne. Then, the shoe, flattened and without curvature on its faces—resting, therefore, on a strictly horizontal plane—is

put on the foot in such a manner that the clip of the heels rests against the internal face of the quarters. This done, the space between the two heels is measured with a compass, and then the dilator is applied (fig. 19). This instrument represents a true

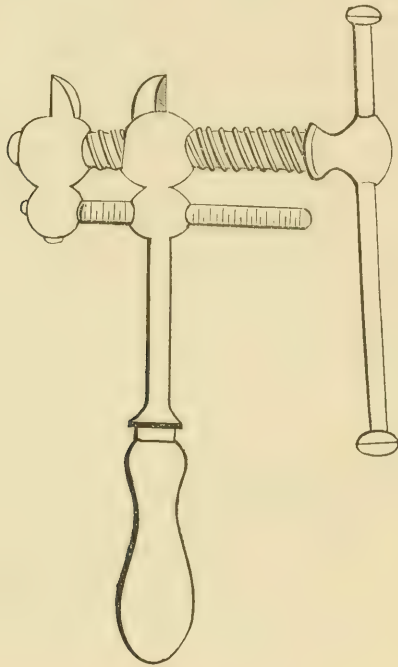


Fig. 19.

vice, with jaws reversed, moving from, instead of approaching each other. It is formed of two jaws which can be made to approach or separate by a transverse screw put in motion by a movable lever. The degree of separation is regulated by a graduated rule placed horizontally, which serves also to maintain the jaws at the same point when separated. The two jaws being introduced between the heels of the shoe, the vice being held perpendicularly to the plantar face, the screw is slowly turned until the branches are opened, say, eight or nine millimetres; then at the point or points of the shoe which have yielded to the pressure of the instrument, one or more blows are struck with a hammer on the outside of the branch of the shoe, to loosen the instrument, until

it drops down, without disturbing the screw, a record being made of the degree of dilatation secured, upon the graduated register. After three or four days the same operation is repeated, the spreading being then not more than four or five millimetres. It must be less than at the first, because at the beginning the less perfect contact between the projection of the heels of the shoe and the wall has allowed a considerable amount of dilatation without producing much result. These repeated dilatations once in four days for a month, are assisted by the application of soft poultices in horses which, on account of the pain and consequent lameness, are kept in the stable. Others may be put to work, and receive poultices only when at rest, or may be turned into damp fields. The shoe rarely needs changing during the treatment, which lasts about a month. This mode of opening the heels is especially practicable and of easy application, and has the advantage of allowing the use of the horse, whose foot is as well protected as with the ordinary shoe. It becomes indispensable when the disease has been of long continuance and is accompanied with much lameness. It is liable to but one contra-indication, and that is when the foot is not sufficiently strong to hold it, by reason of the heels having been pared down excessively. It has been tested for a long time, not only by the Defays, Senior and Junior, but by many others. H. Bouley, in France, with Hartmann and Mayer in Germany, recommend it as an excellent curative treatment.

We must again mention the simple and light desencasteleur of Jovard, (fig. 20) which is as powerful as that of Defays. It is



Fig. 20.

composed exclusively of a double vice, with opposite threads, opening or closing two strong claws, which are applied upon the internal borders of the branches of the shoe; a rod of iron is introduced in the holes at the head of the vice and puts the instrument in motion.

It may be said, that on general principles, it is preferable to treat hoof-bound by the use of dilating shoes than to resort to the bloody operations recommended in earlier times. It is these that Brogniey recommended highly for the removal of one or two quarters of the wall, with an appropriate dressing. H. Bouley, however, believes that it would be wrong to discard these operations entirely; he believes that there are conditions where they become necessary, and where they furnish better and quicker results than the others referred to.

We cannot overlook the treatment recommended by Barthelemy, which consists in the thinning first with the rasp, then with the drawing knife, of the bars, in their whole length, depth and thickness; thinning them down to a spring under the pressure of the finger. This done, a layer of blister is applied on the skin of the cuti dura and upon it, in the parts corresponding where the hoof has been thinned down; the application to be renewed several times, until the lameness has subsided. This operation is followed by an excess of the horny secretion and a marked enlargement of the hoof, and gives good but slow results. Gross has often operated in the same manner, alternating the blister with poultices.

A *modus operandi* which has also been very satisfactory, is the one that was recently made known by Weber, and which consists in the division of the wall at several points, by grooves extending down to the keraphyllous horn, in the direction of the fibres of the hoof. Two or three are made, on each side, between the quarters and the heels, the heels at the same time being pared down, when a bar shoe is put on, which rests on the frog, or if that organ is atrophied, pressure upon it is simulated by the addition of pieces of leather. Frequently, instead of paring the heels down excessively, and when the frog is atrophied, we prefer a slipper after having pared the sole and bars to a spring. The method of Weber is not new. It was previously known by Lagueriniere, and is mentioned by Buginet and Herbert d'Arboval. With it we may slowly but surely achieve success, and there are but few feet which are not relieved or cured; but the grooves must be renewed from above at each shoeing.

Solleysel made lines of cauterization on each side of the heels, extending from the hair to the shoe, which, running through the hoof, softens it and renders it more tractable.

We cannot at present consider the complications likely to be encountered, but must satisfy ourselves by remarking that in case of false quarters, to avoid the painful pinching of the soft parts between the two walls, there is nothing better than to clean the place of separation thoroughly with the drawing knife, and to fill the space with a putty of gutta percha.

DISEASES OF THE FROG.

This part of the horse's foot is exposed to many pathological lesions. Some are merely accidental, and result from the introduction into its structure of nails, and other various foreign bodies, more or less sharp, which the animal picks up in walking or performing his work. We have already considered these forms of lesion in the article upon Punctured Wounds. The frog is often bruised, a lesion which may be followed by a complication which we may be allowed to consider under the name of furuncle of the frog. But besides this, some special diseases are also observed, amongst them one already known to us under the name of *canker*, and another which is more commonly known under that of *thrushes*.

(A) *THRUSHES*.—This affection is often, but wrongly, considered as the beginning of canker, being characterized by the presence of a puriform secretion, blackened and very foetid, which collects and accumulates in the lacunæ and excavations of the frog, whether in its middle or upon its sides. There is often an increased sensibility of the parts, which in some cases may give rise to very serious lameness, preventing the animal from standing, and rendering the movement of walking very painful. The horn of the frog often becomes soft and thready, when the frog is called *rotten*, and the softness increases until it drops off by piecemeal.

The causes of this affection are, first, excessive work on stony roads; changes from excessive dryness to moisture; the strong muds of streets, and standing in damp and dirty places, especially

in urine and manure, as is often the case in badly kept stables. But there are horses whose feet are also affected with thrushes even when standing on a dry bedding; those whose feet are contracted; and again, well-bred horses with good frogs, and in which there is a constitutional tendency to that condition of the horny structures.

The treatment consists in avoiding all known causes likely to give rise to this morbid condition of the frog. Sometimes the foot must be pared, and all the parts where the puriform secretion collects exposed and thoroughly cleansed. The lacunæ of the frog are then to be dressed with Villate's solution, Ægyptiacum ointment, and sometimes only with simple drying powders, a mixture of subacetate of copper, burnt alum and tannin. When the pain is excessive, glycerine, with a little Goulard's extract or per-chloride of iron, is very beneficial. In some cases again, excellent results are obtained by poulticing. It is certain that proper shoeing must, in many instances, be of great advantage.

(B) **FURUNCLE OF THE FROG.**—Under this name is understood the partial necrosis of that portion of the plantar cushion which is situated above the frog proper, from a bruise of that part of the hoof. Loiset describes it under the name of *plantar fibro-chondritis*, connecting it with quittor, which he named *lateral fibro-chondritis*.

(I) *Symptoms.*—There is nearly always, and especially at the outset, a severe lameness, the greater in degree as the mortification is more extended and more deeply situated. While standing, the affected leg is carried forward, resting on the toe; the heels are raised, and the fetlock is half flexed. In action, the rest is very slight, sometimes quite absent, and occurs on the toe only. As the disease progresses, and the necrosed spot develops itself, the animal rests his foot better, and the lameness diminishes.

Upon examination of the foot early in the history of the case, a small opening may ordinarily be discovered, either on the body of the frog or in its branches, while at other times there is merely a discharge of a yellowish serous pus of a strong odor, and more abundant in quantity than would be expected from the size of the

wound, while surrounding it the hoof is loose and sometimes ready to drop off. If the disease is several days old a mass of dead tissues is ordinarily found partly loose, projecting through the opening of the frog, which has the aspect of a whitish body, slightly green, soft, loose and detached amongst the surrounding tissues.

When this core (*bourbillon*) is not visible it may sometimes be felt with the finger introduced through the wound in the frog.

If there is no lesion of the frog the purulent fluid accumulates under the hoof, raising and loosening it from the velvety tissues to a varying extent. Fluctuations may be sometimes even felt under the hoof. Sometimes the pus oozes through the lacunæ of the frog, while again it may then appear at the heels, after making its way under the entire sole.

(II) *Pathological Anatomy*.—As we said at the beginning, the characteristic lesion of the frog is the gangrene of a portion of the fibrous structure of the plantar cushion, when it changes its general appearance and becomes of livid yellow-greenish color, while at the same time a process of elimination takes place in the surrounding parts, and pus forms, separating the dead tissues from the healthy structure surrounding. This process of elimination is more active on the surface than in the deeper parts of the plantar cushion, to which very often this core remains attached. In some serious cases the disease becomes complicated with necrosis of the plantar aponeurosis, or of the *os pedis*, and sometimes of caries of the lateral cartilages, or cartilaginous quittor.

(III.) *Causes*.—Furuncle of the frog always proceeds from some violent injury through the horny envelope of the tissues it covers, either when the hoof has been cut through and through by a sharp instrument, or as the result of some simple bruise without solution of continuity, contusion, or even crushing. Any foreign body likely to produce a punctured wound of the foot may produce it. But in such cases as are accompanied by furuncle it is necessary that the wound should be more of a contused or bruised than of the punctured variety. Rough, angular stones

are the most common agents of injury, being often picked up between the shoe and the frog, and then, pressing more or less upon the tissues underneath, they produce the same result when they are located in the laminae of the frog.

A thick, voluminous frog in a foot with low heels is very much exposed to the class of injuries under discussion, equally with the frog whose horny covering has been pared too closely.

(IV.) *Treatment*.—The first indication, says H. Bouley, when one has to treat a furuncle of the frog, is to thin down as much as possible the horn of the plantar region, and especially that of the frog, of the bars and the branches of the sole, in order to avoid the painful pressure it would produce if its thickness should interfere with the expansion of the parts. This done, if the frog is already punctured, and there is an opening communicating with the cavity where the core (or *bourbillon*) exists, a free incision or opening must be made through the hoof and the fibrous covering of the plantar cushion, and thus the escape of the pus facilitated. If the horny frog has remained intact, a longitudinal incision must also be made in order to allow the frog to discharge, and avoid further burrowing or undermining of the hoof. It is bad practice to attempt to pull the *core* out with a sharp instrument. It is better to leave it undisturbed and wait for the natural process of elimination, which may, however, be hastened by the application of a poultice. The time required for the entire separation of the necrosed spot varies, and as it approaches, the animal begins to improve in the matter of resting his foot. When it becomes entirely detached, the cavity which it occupied in the plantar cushion is treated as a simple wound, with turpentine or tincture of aloes. However, a dressing supported by the shoe with plates is always advantageous, and must be frequently repeated. No great length of time is usually required for the entire healing of the parts, and the animal is soon returned to his work.

In a few cases, nevertheless, the furuncle becomes complicated with necrosis of the plantar cushion, disease of the os pedis, or of the lateral cartilages, the treatment of which must vary according to the nature and severity of the lesions. In these instances operations similar to those required in cases of deep

punctured wounds of the foot or in cartilaginous quittor are indicated.

KERAPHYLLOCELE.

This name was given by Vatel to a tumor which forms on the internal surface of the wall of the horse's foot, at the expense of the keraphyllous tissue, which becomes hypertrophied. These tumors are sometimes irregularly rounded, at others elongated, but usually rounded and again flattened from side to side. They vary in size from that of a goose quill to that of the finger, and while in some cases they occupy the whole length of the wall from the coronary band to the plantar border, in others they only begin at one-third or one-half of the height of the wall. The difference in size allows a division of keraphyllocele into complete and incomplete. At different points the columns are roughened by frequent enlargements. Sometimes full and formed by a very compact and hard tissue, they are, however, sometimes of a fistulous character and accompanied by a blackish discharge of an offensive odor. The lamellæ of the reticular tissue which are nearest to them are generally wider and thicker than in the normal state. As the tumor increases it compresses the lamellated tissue and the corresponding surface of the os pedis, injuring the soft parts, and resting in a groove they thus form for their development.

The causes which give rise to their development are more especially cracks of the walls; though they often follow laminitis or supervene upon severe operations on the wall. Vatel claims to have observed them after injuries to the hoof resulting from the hammering of the foot while being shod.

The symptoms are very obscure. At first the animal is but slightly sore in traveling, but the lameness increases as the tumor enlarges in size. The region surrounding the tumor is always warmer and more sensitive than is natural. In many horses the coronet presents a swelling, well marked. In some cases the diseased quarter is depressed, and the toe seems elongated. When a toe or quarter crack is accompanied with severe lameness keraphyllocele may generally be suspected. But when none of these external signs exist it is exceedingly difficult to make a positive

diagnosis of their presence: for though the swelling of the coronet, the heat and the pain of the hoof may be present, those symptoms may belong also to other diseases of the foot. Then the only means at our disposal is to pare the foot well down, when, at the surface of the sole, the extremity of a portion of hoof ordinarily harder than the normal consistency may be detected.

The treatment consists in removing the portion of the hoof corresponding to the horny tumor, as in a case of cracks, and treating the wound thus made in the same manner, according to the indications presented.

LAMINITIS.

SYNONYM: *Behc, Verschlag, Hufentzündung*, German: *Fourbure, Fourbature*, French: *Rifondimento*, Italian; *Aguadura*, Spanish.

By this name is understood the bloody congestions of the keratogenous apparatus of ungulated animals. The increase of the circulating fluid produces a swelling of the living tissues of the foot; but these being enclosed in a box of so hard, resisting a material, a painful pressure results, which becomes specially common and serious in horses and other solipeds. It has also been observed in bovines, though it is then less frequent and serious. It has also been seen in sheep, in goats and in swine. It may, in fact, occur in all ungulated animals. Dogs, even, are not exempt from its attacks.

The simple bloody congestion, more or less inflammatory, of the keratogenous apparatus of the horse, is sometimes called *acute laminitis* and *acute founder*. The disease may pass off by resolution, leaving no traces of its occurrence, but more commonly it becomes complicated with some lesion of more important and serious a character, as hemorrhage, suppuration, inflammatory exudations, and especially of a hypersecretion of the horny substances, in which case it becomes *chronic laminitis* or *founder*; an affection which gives rise to alterations of a peculiar nature, and leads to certain changes in the form and character of the hoof. We do not agree to the divisions admitted by several authors, into *traumatic laminitis*, *rheumatismal laminitis*, and *metastatic laminitis*.

I. *Symptoms*.—Laminitis, in most instances, is preceded by certain general symptoms, such as are premonitory of the invasions of ordinary inflammatory diseases, but of an uncertain significance. There is dullness, general insensibility, muscular tremblings, and stiffness of the loins. The respiration is accelerated, the pulse febrile, the mucous membranes injected, the mouth dry, the fecal discharges dry and coated, the urine scanty; and perhaps anorexia is present. Rodet, who held that laminitis is more a secondary than primitive affection, and that it is simply an inflammatory anaisothermical fever which had localized itself, was obliged to acknowledge that this fever has nothing characteristic, and that it is always followed by laminitis.

It is certain, however, that but a short time elapses—from several hours to one or two days—after the originating cause has become active, before the bloody congestion of the reticular tissues and the peculiar phenomena belonging to the disease become manifest. It is only when the capillary circulation of the foot has considerably increased, and when the rigidity of the structure prevents the swelling of the podophyllous tissue, that laminitis truly exists.

Laminitis in the horse has the following principal symptoms: Considerable heat of the entire foot, extreme sensibility with intense pain, increasing rapidly, and obliging the animal to rest upon the sound legs, in order to relieve the affected ones; difficulty and uncertainty in walking; and sometimes a peculiar trembling of the muscles of the patellar face of the femur, and of those of the extensors of the fore arm, which fill the triangular space formed by the scapula and the humerus. The physiognomy always indicates intense suffering. The pulse is hard, the respiration increased, and the skin hot, and in places moistened by a copious perspiration. These symptoms vary with the legs which are affected, whether the disease is located in the fore or hind feet exclusively, or in all four together. As Mr. Bouley says, it is a peculiarity of this affection that it may remain localized in the feet of one patient, either forward or behind, or may at once attack the four extremities, and that it seldom attacks the limbs on one side only, to the exclusion of the feet of the opposite side,

i. e., it may be laterally biped, affecting either both the fore or both the hind feet, but not often occurring otherwise. Sometimes, however, the disease is more marked in one leg than in the other of one biped. It is generally only after some traumatic lesion, or other local influence, that laminitis occurs in one foot only.

When laminitis affects the two anterior feet, the animal carries its extremities forward, and the hind feet are brought well under the centre of gravity. The standing of the animal is altered, the walking difficult and painful, and the resting of the feet on the ground is done with hesitation and fear. The feet are carried forward, because the pressure takes place on the frog and on the heels; if it should occur as in the healthy and normal condition, upon the entire inferior circumference of the foot, there would be pressure upon all the living tissues, which are gorged with blood, tumefied and painful, and this pressure would greatly increase the sufferings of the patient. It is, then, to relieve himself, and to avoid the intensity of the pain, that the animal instinctively changes its mode of resting on the ground. In placing the heels down, the weight is borne only upon a follicular, fatty tissue; from there it spreads along the side of the coronet to the fetlock, and thus upon all the other portions of the leg, and in this way the foot becomes greatly relieved during the action of resting. If, however, the fore legs only were carried forward, the effect would be equivalent to lengthening the body of the animal, and he would be unable to carry on the action of walking. To allow the fore feet to be moved, it is necessary that the body be carried forward by the hind legs and brought closer under the center of gravity, a position which contributes also to the relief of the animal while at rest.

The more painful and diseased the feet become, the more the animal fears the impingement of the ground. Thus, so to speak, he sounds the ground before putting the foot down, and for this reason the walking becomes slow, stiff and difficult, and the noise of the contact of the foot louder than that of the healthy legs. Sometimes the animal proceeds only by a series of jumps, or a kind of rearing, while backing is especially difficult.

The hoofs of the foundered feet give to the hand, when feeling them, a sensation of heat greater than that in the physiological condition; a sensation which can be more readily detected by a comparison of the fore and hind feet simultaneously examined. The pains in the diseased feet are rendered more manifest, also, by percussion upon the hoof with the hammer, when each blow, however light, is followed by a motion of the animal in suddenly withdrawing his foot on account of the pain experienced. The lateral arteries of the fetlock, in the foundered legs, beat stronger than in health, and can be readily felt by the fingers. The feet cannot be raised without great effort, and when raised, the animal stands only with great difficulty, and makes struggling attempts to relieve himself and resume its natural mode of standing on four legs.

When laminitis affects only the fore feet, the animal will sometimes remain standing for a length of time together; he may retain this attitude for several days, without any displacement of his body; still he is observed moving *surplace*, from side to side, especially on his fore legs, relieving one foot for a moment to give the same comfort immediately afterwards to the other. But when, exhausted by fatigue and pain, the foundered horse lies down, it is very difficult to get him on his feet again. He continues in the decubital position, lying mostly flat upon his side, the fore legs in constant motion, and soon complicates his diseased condition by the addition of bed sores upon the prominent parts of his body.

The attitude of the animal is very different when the hind feet are affected; then both the anterior and posterior bipeds are brought close to each other, the feet of the hind legs being carried forward under the abdomen, so that the rest may take place upon the heels; and the anterior ones are carried backwards, and nearer to the center of gravity, to assist the function of the hinder extremities in sustaining the weight of the body. In this case, the animal is constantly in side motion, on account of the pain he endures. Walking is still more difficult, and seems to take place as if the animal was treading on sharp needles, as, the more the anterior biped is engaged under the body, the

more also those legs are loaded with the animal's weight, and the more difficult is their movement. But the anterior legs, contrary to their ordinary function (not being adapted to the support of an overshare of the body) sustaining now a great part of its mass, and moreover, compelled to assist in the act of propulsion, necessarily and inevitably become easily fatigued, and too often in their turn become likewise affected. Animals suffering with posterior laminitis are found occupying the standing position less frequently than those whose fore feet are affected. Their unsteady equilibrium, consequent on their mode of standing, tires them more quickly, and compels them to lie down, and once on the ground, it is again more difficult to make them rise. They may do so readily with the fore legs, but the posterior extremities do not always respond to the call.

The attitude of animals suffering with laminitis of all the four feet, is the same as of those which are affected in the fore feet only. All four feet are carried in advance of their plumb line, the anterior forward, the posterior well under the center of gravity. Sometimes the horse has all his feet somewhat apart, in order to carry the principal part of the weight on the inner side of the foot. The standing posture being painful to either foot, the animal lies down most of the time. Locomotion is very difficult and staggering, and the animal can only be induced to move by severe punishment, and even that cruel resort sometimes fails to effect it. If the animal is made to walk, he does it with the greatest difficulty, by reason of the increase of his sufferings, brought on by the displacement. His legs, stiff and trembling, are raised in a convulsive manner, and brought back to the ground only with the greatest hesitation, and upon the heels; the constant motion of the lips of the animal being well characteristic of his sufferings.

In the ox, laminitis is more frequent in the hind than in the fore feet. It is, however, more serious in the latter, the inner being more affected than the outer toe. The foundered ox walks with hesitation, and takes advantage of every opportunity to lie down. When standing, his back is arched, the feet closed together, the hind feet resting on the heels, the fore legs on the

points of the toes. The fever is severe, sometimes attended with loss of appetite and of rumination. If the disease continues long, the cattle will die. The abdomen is stuck up and the animal loses flesh very rapidly, indicating a serious condition, as the disease is principally found in fat animals, which are obliged to make forced marches to be delivered at their markets.

II. *Termination and Complications.*—Well treated, laminitis is generally of short duration, and ends in three or four days by *resolution*. Sometimes, however, this is not accomplished until a later period, even towards the tenth day, though cases of this character are rare; and even when resolution proceeds slowly, some lesions in the foot may be looked for, and chronic laminitis will probably result. Resolution in acute founder is marked by the gradual disappearance of the local and general symptoms. In some subjects, the improvement is quite rapid from day to day, and the form of termination is known as *delitescency*. Laminitis ending in resolution is not usually followed by alterations in the horny box or the tissues which it covers.

When the congestion which constitutes the disease terminates otherwise than by resolution, it is always followed by accidents of varying character. Some of these may have a happy termination, but in the end are more or less likely to be followed by a deformity of the horny box, to which the name of *chronic laminitis* is given. Before entering upon this, however, let us examine the various complications which may follow acute founder, and study in succession: the *hemorrhage, inflammation with exudation, suppuration, gangrene, consecutive arthritis, metastasis*, and lastly *chronic laminitis*. Resolution is most commonly met with in the ox. Sometimes the separation of the hoof by suppuration occurs, and chronic founder is not observed in that animal. It is seldom that seedy toe is observed.

a.—*Hemorrhage*, or *apoplexy* of the reticular tissue, is due to the rupture of the excessively distended capillaries, when the extravasated blood either infiltrates into the meshes of congested tissue, or spreads around it, and penetrates between the podophyllous and keraphyllous lamellæ, filling up the spaces at the toe, the

mammæ and the anterior parts of the quarters, the os pedis being pushed back by the pressure of the incompressible fluid. The pain is then very great; the blood continuing to separate the tissues, often oozes at the coronary band.

If this last sign is absent, a groove may be made with a drawing-knife in the region of the toe, behind the commissure of the sole and of the wall. If we meet with a cavity, resulting from the extravasation of the blood in the podophyllous and keraphyllous space, or if blood flows out from it, the true nature of the complication becomes at once apparent. This mode of exploration is generally difficult, as the animal in pain does not readily allow his feet to be raised, and, as the other foot cannot sustain the entire weight of the body, the horse easily falls down. It is sometimes necessary to throw the animal, in order to make this exploration, which very often becomes necessary if we would know accurately the progress of the disease.

b.—Inflammation, with fibrinous exudation, or pseudo-membranous formation on the surface of the podophyllous tissue. The transudated fibrine mixes with the hoof, secreted by the podophyllous tissue, and this matter separates that structure from the keraphyllous laminæ, especially at the anterior part of the region. Again, in chronic laminitis we find this abnormal secretion pushing the os pedis forcibly backwards and separating the toe of the bone from that of the hoof, and thus producing a pain still greater and more violent than that produced by the laminitis and the hemorrhage. These pains are often so intense that they give rise to an access of furious vertigo. But pains, even when of an exaggerated degree, indicate simply the presence of the exudative form of laminitis. It is not a positive sign; the foot must be explored at the toe, where, in the vacuum which exists between the horny lamellæ is found, more or less abundantly, a citrine serosity of a slightly reddish color. Sometimes this serosity oozes between the hair and the hoof, in consequence of the separation of the tissues at the coronary band, and appears in the form of a thin, reddish foam, about the band itself.

c.—*Suppuration* between the wall and the podophyllous tissue is a complication more rare than the others, but which, however, has been observed, especially when laminitis is traumatic. We have seen it appear under the sole and separate it entirely from the tissues underneath. In these cases, the pain is always very great, and the living structures are pressed beyond measure. Standing is impossible, and the animal continues lying down, or, under the influence of the pains, constantly moving from one leg to another, balancing himself, so to speak. There is no relief for him until the suppuration has shown itself between hair and hoof, when it oozes outward at the coronet. Relief, however, may also be obtained by making an opening at the toe with the drawing-knife. This complication often results in the entire separation and dropping off of the hoof. Cases have been observed when this accident has taken place as early as the third day (Lafosse, Stanley.) Gillmeyer has seen a new foot grow out entirely, but this requires a long time.

d.—*Gangrene* of the sub-horny tissues sometimes takes place, though seldom, under the influence of the excessive pressure, especially when there is sub-horny exudation. The violent pains then cease suddenly; the resting becomes more solid; the movements take place without difficulty. But at the same time, the physiognomy of the patient becomes anxious and contracted; the pulse becomes small and difficult to count; the temperature of the body diminishes; the animal has a trembling gait; is indifferent to any excitement; he is prostrated, and soon he ends by septicemia. The hoof then often drops off, and the sub-horny tissues are seen to be of a bluish-brown color, without consistency, but with a very foetid odor.

Volpi thought that laminitis was the inflammation of the articulation of the foot; but this *arthritis*, if it exists (a fact which is rare), is not a consecutive phenomenon, but a complication. The inflammation does not remain limited to the reticular tissue; it extends also, and consecutively, to the contiguous structure, spreads to the tendons and articular ligaments, even penetrates to the synovial capsules of the articulation of the third with the second phalanges, and may also react upon other parts

of the organism. The ankylosis of the articulation of the foot with that of the coronary joint are complications somewhat frequent, as well as that of the ossification of the cartilages of the foot.

f.—*Metastases* have been often observed, and when accompanied by intense fever have been noticed as complicated with serious diseases of the chest, especially of pleuro-pneumonia. At other times it has been the intestines to which the metastasis has transferred the disease, in which case there is, in most instances, constipation of the bowels. Enteritis, however, is seldom observed, notwithstanding what has been said on the subject. This metastasis has also been seen toward the lumbar region, and this is much more commonly believed from the fact that there is more motion at the hip than at any other joint during locomotion, and also because the back and the loins are more or less arched. In fact, laminitis has been by some designated as an affection of the loins; some have looked upon it as a rheumatism of that region. All these errors have originated in the peculiar motion of the animal while walking, or of its peculiar mode of resting when standing still. We have also observed an attack of complete myelitis as a complication of laminitis.

g.—The most common complication met with in *chronic laminitis* is an affection which we might have treated as a special subject had we not, upon principle, considered it as a sub-inflammatory state of acute founder of the foot. An attack of laminitis which has not ended by resolution in five, ten, or fifteen days at most, takes a character of persistency which, in most cases, ends in absolute incurability. To properly study chronic laminitis we must observe it when the alterations which characterize it are accomplished. When we have completed the consideration of the pathological changes we will examine the intermediate period, and discuss the mechanism by which these alterations take place in relation to the pathological anatomy.

The first thing observed is the change of form in the hoof. The nail of a horse's foot easily recalls the form of a Chinese shoe. (Knollhuf of Germany.) The hoof seems to have lost its

varnish and its suppleness in the points corresponding to the diseased parts. It is, besides, brittle, and seems to have lost part of its connection with the remaining parts of the foot, and there is a change in the direction of the wall, the fibres of which, instead of being oblique to the ground, assume an almost horizontal direction. The foot seems as if flattened from above downwards, and the lines which bound its surface form a well-marked obtuse angle with that of the coronary region. The anterior wall of the foot also forms a well-marked projection forward, from which results a great exaggeration of the antero-posterior diameter of the nail with the transverse diameter and the oval form of the horny box. The external surface of the wall, instead of being smooth, as in physiological conditions, presents, on the contrary, a roughened appearance, which results from the presence of circles of ridges and circular grooves, placed one above the other and extending from one heel to the other. A remarkable peculiarity is here observed in the fact that in the anterior part of the nail the circles are quite near each other, while, on the contrary, upon the lateral parts they are separated by much wider grooves. When, then, at the toe, the wall has some difficulty in growing downwards, on account, probably, of the internal adhesions between the podophyllous and keraphyllous tissues; the heels, on the contrary, grow without difficulty, and thus obtain a relative height superior, and sometimes even equal, to that of the toe. Often at the mammæ and quarters of the foot contractions are seen, and longitudinal grooves running from the coronary band to the plantar surface, reminding one of the lesions met with in encastelure.

Considered on the side of the inferior face the old foundered hoof offers four remarkable lesions. Besides its oval form, a disposition altogether different from that of the normal state, the sole is convex in all the anterior part of the plantar region, especially at the point of the frog. There exists at that point a transversal tumor or enlargement, projecting sufficiently to exceed in height the inferior border of the wall. The solar sheet has been pushed outward by the pressure against the superior face from the contents of the horny box, and the foot is convex. This convexity never equals the entire extent of the foot, the deformity

ending at the boundary of the inferior border of the bars, beyond which and backwards are found the cavities of the lateral lacunæ of the frog, so much more elevated as the heels are also higher. The centre of this tumor or enlargement of the sole is often flexible under the pressure of the finger, and generally bleeds easily on the application of the sharp tools of the blacksmith. It is not rare to see the sole perforated through and through and showing the inferior border of the os pedis projecting through the border of the bone, which then soon becomes necrosed. This is the result of the excessive displacement of the os pedis and of the strong pressure upon the velvety tissue against the sole-tissue, which is atrophied or even destroyed. This is an ulcerating wound, somewhat semi-lunar, secreting a very offensive pus, with granulation and some proud flesh, or even separation of the sole.

Between the sole and the wall the line of demarcation is no longer so well defined as in the normal state. At the toe, the mammæ and the anterior part of the quarter, there is an excavation formed of softer horn of bad nature and less identified with the true horn of the wall and of the sole. A complete vacuity is often found, a cavity around the internal face of the wall at the toe and at the mammæ of varying depth and size, but always larger at the inferior than at the superior end of the foot, where it gradually diminishes, and often contains a dry, granular mass, resulting from the drying of the blood, and the dried plastic lymph, mixed with small, horny, pulverized masses. This cavity is formed in front by the healthy wall and posteriorly by a new wall due to the secreted hoof thrown upon the podophyllous tissue; this is called *seedy toe*. This double wall is observed especially after laminitis of the hind feet; it is more common in the donkey and the mule; it is also noticed in horses with small feet, as in those of Oriental breeds.

The deformities of the horny box due to chronic laminitis are not in all cases identical in their character; there are degrees in them, and consequently they vary in their features, which variations are due to the duration of the disease and its intensity, and also, according to H. Bouly, to the primitive form of the diseased foot. In a case of chronic founder of the fore-

feet one may often notice a difference between the deformity of the left and that of the right foot. The deformities may take place at various times, and one may find a well-marked case of seedy toe while as yet the wall has preserved its normal oblique direction and shown only rudimentary ramy appearances. Again, the wall may have undergone changes in its direction only at the new hoof, which grows from the coronary band; there is then formed between the old wall and the coronet a circular groove, sometimes called the *digital cavity*, the deformities of the wall taking place only as it grows down. At times, also, instead of the groove, there is a ridge of horn at the coronary band, originating in the hyper-secretion of the horn, which grows also downward. And, again, there are cases where there is seedy toe and still no well-marked alteration of the shape of the wall of the sole.

Chronic laminitis is always accompanied with more or less lameness. There are cases, however, where it is missing; for example, in seedy toe. Ordinarily the foot is raised from the ground with a convulsive motion, as may be well observed in donkeys and mules, which animals rest their feet on the heels. This soreness diminishes with time, as the foot, assuming its new form, offers a wider space to the sub-ungulated tissues and presses less upon them, these tissues having at the same time become somewhat atrophied. In cases of hernia of the os pedis the resting of the foot on the ground is almost impossible, the animal being afraid to bear his weight on the sole. The heat and the pain of the feet are less marked. The percussion is louder in case of seedy toe, while it is duller when the space between the wall and the reticular structure is filled with hoof of new formation. This percussion is very painful in case of keraphylocele. Unless there are serious lesions, chronic laminitis is not accompanied with fever.

III. *Pathological Anatomy.* At the initial period of laminitis, when there is only simple congestion of the keratogenous apparatus, and especially of the podophyllous tissue, the sub-horny tissues are in a condition of sanguineous derangement, characterized by objective signs. When the hoof covering them

during life is removed, they are found of a dark red color, in a kind of erythema. When pressed between the fingers, their thickness is noted to be increased, and they are found to be gorged with blood, an incision made through them allowing the escape of a large quantity of that fluid.

If the laminitis exists for several days, the podophyllous tissue is found to be infiltrated with plastic exudations, and if there has been hemorrhage or apoplexy, blood is found between both the sensitive and insensitive laminae. In other cases there is pus, and in case of gangrene, the tissues are found of a livid color.

The alterations are still more serious in cases of chronic founder. When a foot, foundered for some time, is divided by the saw in its antero-posterior axis by a section of all the parts, the thing first noticed is a change in the connection of the os pedis with the wall. These changes, however, exist principally at the toe, and extend as far as the half of the quarters, on a level with the lateral cartilages of the foot, while further backwards they are not to be observed. On the side some laminae are always found in their normal condition, as can be seen by a section of the foot made transversely. Generally, a yellowish substance, of horny appearance, but softer, fills up the space situated between the walls and the keratogenous structure. This is the product of the exudation of the inflamed podophyllous laminae, mixed with the horny substance which they secrete normally. These laminae are themselves hypertrophied, being sometimes one and two centimeters in length and exceeding by four or five times their normal size. The keraphyllous laminae are also hypertrophied, a condition which is evidently due, as respects the podophyllous tissue, to the increase of vital activity, resulting from the inflammatory condition of the tissue and to the infiltration by fibroplastic exudation, resulting from the inflammation. As to the keraphyllous laminae, they repeat on the internal face of the wall, in an inverse manner, the disposition of the secreting laminae of the hoof between which they are formed and lodged. These, however, as they increase in extent, unite at their base in the whole of that portion which does not co-operate to their union

with the podophyllous bands, and then forms a compact mass uniting most frequently with the internal face of the wall. Sometimes this mass of yellowish hoof occupies the whole space between the os pedis and the wall, but in some cases it adheres only to the wall, when it forms around the keratogenous tissue, a new wall, also provided with keraphyllous laminæ, and there is formed between it and the normal wall that porous, brittle mass, without homogeneity, which fills up the space, which constitutes the seedy toe. The mass thrown between the wall and the os pedis presses upon it; the anterior face of the bone assumes a vertical direction, and the os pedis presses towards the solar arch on its anterior border at a point situated posterior to that where, in normal feet, this border rests. Notwithstanding its resisting power, the wall gives to the effort of the mass interposed in front, the form of the foot changes, and then results the change to the oval in the contour of the foot. Under the influence of the displacement of the phalanx, not only the flattening and afterwards the convexity of the sole and even its perforation results, but the plantar cushion is itself pressed down and crushed between the bone and the frog, which is then generally atrophied. A hoof of new formation is often developed between the sole and the inferior face of the phalanx, in order to prevent it from necessarily sinking. This increases the pressure upon the bone and contributes to its atrophy and sometimes to its complete disintegration.

But, between the surface of the coronary band and the origin of the hoof, whose formation is anterior to the laminitis, there may also be a new layer of hoof, more resisting than that which occupies the space between the wall and the podophyllous tissue, which is no more hoof mixed with the fibrinous exudation, but a pseudo-hoof secreted by the coronary band. The fibres of this hoof, however, instead of being rectilinear and growing down in the direction of the old wall, with the fibres of which they are continuous, are, on the contrary, sinuous and nodulated, and disposed to take a somewhat horizontal direction. There is often, besides the old wall, a deep horny tumor, a keraphyllocele which grows inside, attempts to replace the soft horn secreted by the podophyllous tissue, and adds to the pressure of the os pedis,

by forming a new wedge, more solid and resisting, which produces a displacement of the phalanx, whose anterior face then often becomes more than vertical. This horny secretion from the coronary band is made evident by a section of a foundered foot, when the cutigeral cavity will be found much enlarged. Guyon, jr., Hertwig, and Gourdon remark that the displacement of the os pedis is counterbalanced by the more rapid development of the heels and the projection of the foot forward; and that thus the phalanx does not support the weight of the body except by its inferior border only, but preserving, nevertheless, its primitive position. It is especially observed that when the foot is completely deformed, the projection of the wall does not prevent the os pedis from remaining in its normal position.

The growth of hoof from the podophyllous tissue and the coronary band is not easily stopped. The horny masses which are formed continue to increase, and even soon end in uniting. There then remains a thick mass of deformed shape, four or five times thicker than the normal wall, but where the keraphyllous leaves are still noticed, corresponding to the podophyllous laminæ, largely developed, and above all, running deeply into the wall of the hoof. The space between the wall and the anterior face of the os pedis is filled with pus besides the secreted hoof; the seedy toe, if it existed, disappears. Though the hoof becomes thus much more voluminous than before, the deep parts are not any more in their normal condition, but are lodged in a smaller and smaller space, and are thus in such a state of compression that they become atrophied. The bone is altered in its texture, as well as in its form, and becomes denser and more brittle. One might suppose that as the disease progresses, the os pedis would become pressed backwards more and more towards the sole, in consequence of its giving way under the pressure. This, however, is not so. As the old normal walls disappear, the new horn yields to the pressure from forward, the heels rise, the os pedis resumes its horizontal direction, and the danger of hernia of the bone diminishes, and a hypersecretion of the hoof is even noticed towards the point where the hernia would have taken place, in the middle of the pumiced sole.

We have, so far, supposed that chronic laminitis is always manifested by the presence, between the internal face of the wall and the podophyllous surface, of a mass of abnormal hoof. But there are cases, after hemorrhage, and especially after serous exudation, where, instead of it, a cavity is found—a seedy toe. There is also an entire separation between the os pedis and the wall. But the horny production, that of the podophyllous tissue especially, is not sufficient in amount to fill up the whole space, there being hoof only upon the podophyllous tissue. There is then a sound wall formed, separated from the old one by a vacuum, which is often filled by a dry mass derived from the blood and serosity, mixed with the horny cells. But more frequently the separation is limited to the height of the podophyllous tissue, and the wall yet remains adherent to the coronary band, by its cutigeral cavity. The band then continues to produce the external wall of the hoof, while the podophyllous produces the abnormal wall, and the seedy toe remains between the two walls.

There are cases where the separation, produced by the congestion of laminitis, takes place to such an extent, in circumference or in height, that the hoof loses all its adhesion, except towards the heels; and then one may see the curious fact of the new generation of an entire new nail within the old one, the former being, so to speak, sequestered in the latter.

IV.—*Differential diagnosis.*—It is possible that, notwithstanding its distinctly characterized physiognomy, laminitis, of the hind feet especially, may be mistaken for a disease of the spinal region. Often, when the founder is light, the hinder parts wag, as in sprains of the loins, but the resting of the feet on the heels, their heat and their sensibility, will soon point out the distinction. In more severe cases, the hinder founder may simulate paralysis, especially if the animals cannot or will not raise themselves. Here, the history of the case is very useful, and the explorations of the feet will assist in making the diagnosis. We have seen cases of laminitis behind, where the raising of the foot has been such that it might be taken for springhalt, or even for locomotor ataxy. It may be also taken for tetanus when in mild form, or yet incompletely characterized.

V. *Prognosis*.—Laminitis is so much more alarming and rebellious as to treatment, as it is more extensive, more serious, and of longer existence. The most serious cases are those which are due to a constitutional predisposition, and those which follow a general alteration, or are complicated with other diseases.

Chronic laminitis is especially serious from the production without separation, and in an excessive measure, of the horny substance. Seedy toe is then less serious, and that which does not extend to the coronary band is sometimes curable by the gradual growth of the hoof; the tumor of the os pedis is the most rebellious to treatment. The destruction of patients is often necessary, from their inability to walk or to do any work, and that notwithstanding all treatment they are entirely useless.

VI.—*Etiology*.—Laminitis has been attributed to many and the most varied causes, and, among others, has now been ascribed to a traumatic origin, consisting of injuries of the foot; and again, to internal lesions, resulting in the inflammatory process which is characteristic of the affection.

The external traumatic injuries, which it is claimed are those chiefly instrumental, are on the contrary, of very rare occurrence as causes of the disease. Our observations agree with those of H. Bouley, and if there is a traumatic causation for this disease, or, at least, one identical with it in respect to symptoms and primitive lesions, it is nevertheless, certain that its progress is very different; there is found with it an evident tendency to suppuration instead of exudation, and there is no such formation as the chronic process which is found when laminitis is due to an internal phlegmasia.

It has been said in reference to the action of the heated shoe upon the hoof, the percussion of the blacksmith's hammer and the pressure of the shoe and of the nails upon the living tissues, that all these causes together must, as their sure effect, make the foot tender, and stimulate in its constituting structure, the congestion which is the initial phenomenon of founder itself. But this assumption may be successfully contested. Bad shoeing may produce many forms of lameness; never laminitis. It has been said that feet of defective conformation are more commonly affected

with founder that those which are well formed. This, however, is not so, and feet with contracted heels are no more predisposed to it than flat feet, as claimed by Girard. Traumatic accidents, as blows, injuries and pressure, produced by stones, crushing of the feet under heavy weights or under the wheels of a truck, etc., may produce a violent congestion of the reticular tissue of the foot, and consequently laminitis. But this founder itself is of too active a character and more complex perhaps, with a natural tendency to suppuration, as we have already said. It must then be considered as varying from laminitis proper, or that form in which the congestion is of a more passive character, or at least internal and somewhat analagous to that which is sometimes observed in the lungs or in the intestines. It might be better described as an "astonishment" (*étonnement*) of the foot, as it is sometimes called.

Laminitis proper is rarely due to a unique cause, but more properly to a number of circumstances or to an assemblage of various causes by which the horse is at first somewhat indisposed—sick in fact; and it is only after various general symptoms that the disease localizes itself in the feet, or, as the old phraseology has it, falls in the feet.

The most effective cause is too abundant, and especially too substantial feeding, which produces plethora by rich blood. It is the use of other grains than oats, as wheat, barley or rye, which especially predisposes to the disease. Latin authors called it *hordeatio* (from *hordeum*, barley), and it is mentioned by Solleysel, Garsault, Gaspard de Sannier, and various hippiatrics. Rodet has observed its bad effects in Egypt and in Spain, where animals were fed not only with those grains, but when they received wheat in spike. Miltenberger had observed the same effects during the war of 1812, in Poland, where the horses were fed with rye. In our days even laminitis is seen breaking out in the years when feed is scarce and when oats have to be replaced by other grains, as is proved by the observations of Bouley, Verrier, Rey, etc. Artificial varieties of fodder also predispose to founder, though less often; even oats, when given in excess, may produce it (Solleysel, Blind), and especially if new oats (Hertwig).

The influence of seasons cannot be denied, and it is during the summer months that laminitis is more frequent, while it is rare in winter, as well as in spring and fall. It is to the warm climates of Spain and Egypt that Rodet attributed in great part the frequency of the founder observed in the army horses engaged in campaigning in those countries. It has been also attributed to the sudden checking of the perspiration, and cutaneous chills when the animals are sweating; a cold bath or the drinking of cold water at that moment having also often been considered as occasional causes.

The work of the horse greatly influences the development of laminitis. It is more frequent in those which are driven at great speed than in those which work while walking, and especially in whose frame an excess of strength is required, and particularly those which labor on rough and stony ground. It is almost inevitable if the animal is well fed and if he is unaccustomed to that kind of work and not trained for it, and most especially if it is during warm weather. This explains why the disease was so frequent amongst post, diligence and coach horses, especially during the period preceding the establishment of railroads, when the expenditure of strength exacted from these unfortunate animals reached the last limits of possibility. More recently, again, during the war of 1870-71, when railroad traveling was more or less impeded, laminitis became more common amongst horses from which an excess of muscular effort was required. It is a frequent and very serious accident among English race horses (Hering).

Laminitis in oxen is due almost exclusively to the fatigue of long journeys and to the repeated frictions of the unshod feet upon the ground. It was very common before the era of railroads in animals brought to markets.

But prolonged rest and inaction also predispose to founder. The disease is frequent in horses making sea voyages. It is not rare to see horses become foundered when they are obliged to stand up during several days in consequence of injuries to the extremities, or other pathological conditions requiring them to be kept in slings. In diseases of the feet which have required painful operations (toe or quarter cracks, punctured wounds of the

feet, quitter, etc.) it is quite common to see an animal persevere in maintaining the standing position, and too often has the leg corresponding to the one first attacked become also affected, leaving both of the anterior or both of the posterior ultimately affected in a serious manner.

It is common for laminitis to follow intestinal congestions, especially if these result from the administration of a drastic purge, as aloes for example, and this is a very serious form of the disease. Tisserand has seen laminitis of the anterior extremities following parturition in mares, and particularly after abortion. Gloag and Smith have observed similar facts. Hertwig says that it sometimes follows rheumatismal affections, especially the acute form.

A metastatic laminitis has been seen following diseases of the chest. H. Bouley does not believe in these cases, and thinks the laminitis is the effect of the quadrupedal standing position, or also the feeding with farinaceous substances in too great quantity. At times founder accompanies malignant fevers, such as anthrax and typhoid attacks, which are always accompanied with a certain alteration of the blood.

VII.—*Treatment*.—In acute laminitis all attempts must tend to remove the congestion of the keratogenous apparatus, or at least to abate its intensity, so as to prevent or diminish the serious sequelæ that may too often follow. To effect this, general or local bleedings have been specially recommended, with antiphlogistic applications upon the congested regions. General bleeding at the jugular is especially indicated; a large bleeding of from five to ten litres, repeated if the pulse or the condition of the disease indicates it. Local bleeding, often recommended, seems to us, generally speaking, to be useless; that of the toe is of difficult performance in founder, as the feet are usually raised from the ground with difficulty, and the operation is quite painful, and may give rise to more or less serious complications. However, in serious cases it can be done while the animal is thrown down, not so much on account of the blood depletion as to prevent the possibility of gangrene supervening. It is more useful in the ox, according to Lafosse, who recommends to pare the foot down to the

quick and to put on the shoe again if the animal has to continue its journey.

The topical applications employed are varied and numerous ; the simplest and most practical is cold water, cold baths at half the leg, taken in running water, if it can be done, and if the animal stands up ; walking in the water is then recommended, if practicable, walking increasing the venous circulation of the part. Instead of running water, ponds, marshy grounds, pools of stagnant water, or even liquid manure may serve the same purpose. In establishments where there are many horses there are special tubs where the water is constantly changed. The animal may be placed in some of these up to his fetlock in an astringent solution. Mathew has invented an apparatus for continued irrigation, consisting of a reservoir of water elevated above the body of the animal : around each coronet is placed in shape of a bracket, a tube of india rubber, perforated with holes opening on the hoof ; from the reservoir runs a tube which bifurcates and furnishes to each leg a descending division connected with the bracket. The water is then allowed to run around the coronet and drip over the foot. Instead of simple water the use of snow or broken ice has been recommended, wrapped in cloth round the hoof ; pads of oakum dipped in solution of salt, sulphate of iron, or alum ; clay poultices mixed with vinegar have also been used. As the heat of the foot has a tendency to rise, the temperature of the liquid or of the topic used must be often changed in order to keep up its antiphlogistic effect. Baths of sulphate of iron are especially indicated in cases of traumatism.

Irritating frictions used as derivatives are also recommended, but their efficacy in this case is at least problematical. Irritation, when the congestion is somewhat passive, is not easy to produce. However, frictions of the hock with oil of turpentine, by the pain they produce stimulating the animal to move and not allowing him to remain in a state of almost complete immobility, may be advantageous. Blisters around the coronet are useful towards the third or fourth day, when plastic exudation or hypersecretion of the hoof are to be feared.

Frog seton is recommended by English practitioners ; Gabriel

says it is a sure means to prevent the separation of the nail. This seems to us unwarranted. Internally, the administration of nitre, cream of tartar, ammoniacal salts, sulphate of soda, are given; drugs which are indicated by the febrile state; alkaline remedies are administered to render the blood more fluid and increase the venous circulation. Aloes, recommended in England and by Hertwig, is contra-indicated, as increasing the disease and facilitating the dropping of the foot.

It has been advised to take the shoes off. This is not only a difficult operation, on account of the sufferings of the animal, obliged to stand up on one leg, but it seems to us useless. Shoeing has not the effect supposed of it in the etiology. If it is well fitted it is not uncomfortable to the foot, while its removal from the shoe, by the hammering it requires, is always painful, and had better be avoided.

It has been recommended to pare the foot, to shorten it, to thin the sole down; but this operation seems to us in many cases superfluous. It is true that the topics will act more readily upon the living tissues underneath, but the advantages thus obtained do not compensate for the difficulty of the operation; at any rate it cannot be done except when the animal lies down.

We shall pass silently the effect, so to speak homeopathic, that English veterinarians pretend to obtain with very warm poultices around the foot, and which have their reasons only when suppuration or gangrene is threatening. Neither shall we refer to the compression of the foot, recommended by Nanzio—a treatment which is much nicer in theory than in practice. In a great number of cases the patient is considerably relieved by resting on a good bed, and this is especially necessary for severe laminitis when locomotion is very painful. However, in less serious cases, walking on soft ground, especially on grass, is an excellent treatment. It stimulates the circulation in parts where the blood has a tendency to accumulate, and controls the venous engorgement of the keratogenous tissue. It has been sometimes recommended to support the animal in slings to relieve him; but as with this one would expose his patient to pulmonary complications, it is better to cast him and keep him in that forced position, being careful to turn him over from time to time.

A dietetic regime, light feeding, during the first days at least, cooling drinks, rectal injections and comfortable blankets are all indicated.

One must particularly watch what takes place in the foot, and for this purpose grooves made at the surface of the foot have also been recommended; but they cannot be made deep enough, as the wall is always there resisting more or less to the eccentric forces of the deep parts.

If towards the third or fourth day there is no marked improvement, especially in traumatic founder, if even the patient becomes worse, if the pulsation at the digital arteries is stronger, harder and more frequent, it becomes necessary at once to thin the sole down, and make a puncture upon the line of demarcation of the sole and wall with the drawing knife. Often then a flow of pus or blood, more or less altered, takes place, the nature of which indicates the progress of the disease. If it is of a grey blackish color, it is evidence that the horny tissue only is affected; while if white, it indicates a greater change. Hertwig advises this operation always, when laminitis is of long duration. He thus produces an artificial seedy toe, which is considered the mildest form of the disease. He recommends to make a deep groove upon this white line so far as there is separation of the wall from the podophyllous tissue, and then combines the treatment with the use of astringent baths of sulphate of copper. We have on several occasions been pleased with this treatment, combining it with the application of a blister around the coronet. It is preferable to the longitudinal grooves, or to the trephining, which is sometimes recommended.

There are numerous cases, however, when, notwithstanding all these rational means, the disease cannot be arrested, and when a fatally chronic laminitis ensues. This must be considered incurable in the majority of cases. It is almost impossible to bring the foot back to its physiological condition, and, above all, to prevent the hypersecretion of the hoof which characterizes it.

However, in case of simple seedy toe, if it is the result of hæmorrhage, or even of suppuration, a cure may sometimes be obtained. Generally, by thinning it down, the entire portion of the

wall which, at the toe, the *mammæ* and the anterior part of the quarters is superposed to the keraphyllous hoof, without adhering to it, is removed. The keraphyllous hoof, also, is thinned down in its whole extent; then a dressing of hoof ointment or tar is applied so as to protect it from drying and to keep it supple. In these cases the hoof coming down from the coronary band has sometimes united with that flowing over the podophyllous *lammæ*. At other times the seedy toe is only cleaned of its contents, and is filled with medicated oakum, if there is a wound of the podophyllous tissue, or with hoof ointment and Venice turpentine, the whole being kept in place by a wide web shoe. The last treatment seems to us the best, only instead of hoof ointment we employ *gutta percha*, melted with gum ammoniac, as recommended by Defays. For this there must be no wound, and the cavity must be well cleaned of all substances, or even washed with ether to remove all greasy substances which would prevent the *gutta percha* from adhesion with the hoof. This course has enabled us to see deep seedy toes recover by the gradual growth of the foot. Hence, the indication to try to obtain an artificial seedy toe as early as possible, as recommended by Hertwig.

When there is thickening of the keraphyllous horn and adhesion with the wall; when, also, the toe is formed entirely by a deformed horny mass, the case is more serious and the treatment more uncertain. It has been recommended, wrongly, we believe, to perform the operation which consists in cutting off all the protruding hoof—to even cut off all the accidental production. To do this the rasp and drawing knife are used, the keraphyllous mass being thrown down as much as possible. D'Arboval has also advised to make with the drawing knife an artificial seedy toe between the internal face of the wall proper, which is preserved, and the anterior face of the podophyllous apparatus, upon which a thin layer is left. This treatment has an advantage over the other of keeping the wall intact, to render easier and more solid the application of the shoe which is to protect the foot and allow the animal to resume his work. This operation, however, is only palliative. It, however, gives great relief, especially in the first steps of chronic laminitis.

Gross has been satisfied with thinning down with the rasp the superior part of the wall, below the coronet, in a width of about four centimeters, in such a way that from one heel to the other there was only a very thin coat, which he protected with basilicon ointment. The coronet was then stimulated with a little oil of cantharidos. Under this treatment a new growth of hoof is started, not so protruding, and by paring down by degrees the hoof, a new foot was grown in a few months, less deformed and more regular.

Meyer and Gunther say that they have obtained good success with this treatment, which nearly resembles that of Gohier and Dehau, except that with those the entire wall was pared down to a thin pellicle, flexible under the pressure of the finger. Silberman advised to place around the hoof, below the coronary band, after paring it down thin, a band of steel, two fingers wide, which could be tightened by a screw placed at the heels. In this way the secretion of the coronary band was kept under control, but not that of the podophyllous tissue.

Generally in these cases the suppleness of the hoof must be kept up by appropriate topics. It must be cut off when too thick, and a shoe must be applied sufficiently wide in the web to protect the anterior part of the sole as far as the point of the frog. This shoe must be quite hollow on the foot surface, so as to avoid any pressure upon the sole. It must be nailed on principally at the heels, as nails at the toe would not hold sufficiently. Between the shoe and the foot a piece of gutta percha, or felt or leather may be put on. Thus shod, a horse will still do long service, even in cities, and much more in the country.

When there is a wound at the sole, with separation of the part, suppuration, caries of the os pedis, which protrudes through the sole, it is advised to have recourse to a surgical operation. The contents of the abscess under the sole must be evacuated, and the sole thinned down in the entire plantar region. If the bone is carious it is scraped, the necrosed parts are removed, and a proper dressing, kept up by plates under the shoe, is put on. There are a few cases where by this treatment horses have been enabled to resume their work.

Often in chronic laminitis when, notwithstanding the operation and the shoeing, the horse is unable to resume his work, according to H. Bouley, the operation of neurotomy will then be beneficial. Grad is not of the same opinion. He claims that the relief is then uncertain and only temporary. Jessen, Hering, &c., say that this operation is followed very often by the sloughing of the hoof, and the animals stumble very easily. According to Bravell this operation is followed by a greater growth of the hoof. If the lameness is reduced after the operation the deformity of the foot continues to increase.

NAVICULAR DISEASE.

SYNONYMS.—*Chronische Hufgenklahme*, German; *Maladie Naviculaire*, French. This disease, called by Loisel and H. Bouley, *podosesamoideal synovitis* (synovite podosesamoidienne); by Brauell, *chronic podotrochlitis*, is an inflammation of the sesamoid sheath of the horse, that Turner and some other English veterinarians were the first to describe, and which is mostly observed in thoroughbreds.

The disease is principally seen in the fore feet, and more commonly in one foot alone; sometimes, however, both legs are affected, one first, and the other following. Navicular disease of the hind feet is seldom observed.

It is accompanied with lameness and deformity of the foot, and often proves rebellious to treatment. It is followed by contraction of the heels, (*encastelure*) which is itself often mistaken for navicular disease. At any rate, the affections are nearly related, whether the disease of the sesamoid sheath, first occurring, is followed by the contraction, or that the hoof, originally contracted, gives rise to the subsequent alterations of structure which constitute navicularthrititis. At present we shall only consider the deep inflammation of the podosesamoideal articulation, occurring without primitive alteration in the form of the foot.

I.—*Symptoms*.—These are at first obscure. The lesion is deeply situated, and is, so to speak, concealed in the hoof, which itself, is generally at first of very limited extent. The first symptom which attracts attention is the lameness, which sometimes,

indeed, seems to be merely a certain weakness of the affected leg. This lameness is at first intermittent and slight, but gradually increases. When in the stable, the animal "points," that is, the diseased foot is carried forward of a vertical line, and assumes a state of general relaxation of the muscles, with the coronet straightened and the foot mostly resting on the toe. This incomplete rest of the leg, which is sometimes kept in motion forward and backwards, becomes especially apparent if the animal is moved backward in his stall. He then sets down his foot with much hesitation, and for a short time; the same thing also occurs when, in order to relieve the opposite leg, the animal puts all his weight on the diseased one. Still, a close examination of the foot fails to reveal any marked lesion; no change of form appearing, no pain at the coronary band; merely a little heat toward the heels, or on the frog, where there can also be found a certain amount of low and deep sensibility, made apparent only by percussion of the hammer upon the foot, or by the pressure with the blacksmith's nippers, principally toward the heels and the frog. According to Lafosse, the frog is often found indurated, atrophied and thrushy. If exercised, the horse frequently stumbles, and sometimes falls on his knees; he fears the pain of resting the heels on the ground, and is limited in the movements of his knee and fetlock. If the heels are pared off, in such a manner that the frog is well prominent, and the horse becomes much heated, the lameness is increased, although at first it may have been very slight. Blacksmiths may frequently obtain the same result by placing under the foot a bar shoe, which, then resting on the frog, and not the heels, greatly aggravates the lameness until it becomes excessive. This mode of diagnosis was originally indicated by Brauell: When, after more or less exercise, the animal is allowed to cool off, he at once points, straightens his fetlock, and slightly flexes the knee; the leg has a trembling motion, and no rest is taken upon the heels.

There are, however, according to Hertwig, cases where navicular disease suddenly reaches a period where, in the stable, the animal avoids all resting on the heel; points constantly, and hesitates to put his foot on the ground when made to walk. It always

seems that there must be some traumatic lesion in the foot, as a punctured wound or a suppurating corn; and still there is no increased heat in the hoof, and no extraordinary pulsation of the arteries of the foot.

The disease has a tendency to increase, and the animal soon becomes very lame upon being put to work, especially on a hard road or rough ground. The heat of the foot is increased principally after work, though not in proportion to the lameness. The sensibility of the foot is also more manifest under the exploring pressure of the nippers. In the stable the pointing is well marked and the trembling of the leg gives signs of deep and persistent pain. It is only after several months of this suffering that the foot begins gradually to show a change of shape. It then becomes visibly narrowed and elongated, in a manner which can readily be detected both by sight and measurement. There is a general atrophy of the hoof; the periople has disappeared, or scales off; the foot becomes covered with ridges, more or less marked, but better developed towards the heels; the frog has become sunken and atrophied; the sole is ecchymosed, presenting evidences of corns; and the leg is atrophied, especially about the muscles of the shoulder.

In cases where both fore-feet are affected, the animal points with either foot alternately, while seeking the desired relief for each, but the rest on either is very short. The hind legs are brought under the centre of gravity, the back is arched, and the decubitus prolonged. In stepping out of the stable, both fore feet are held stiffly, and kept close to the ground; the animal stumbles on his fetlocks, and often falls, and one might suspect him of being weak. In walking, his shoulders seem to be rigidly attached to his body, but as he warms up the legs move more freely and his actions become less limited; but immediately on cooling off, and especially the day following one of hard work, all the symptoms reappear, with even aggravated intensity. The disease increases steadily with the lapse of time. When one, or what is more rarely the case, both hind feet are affected (Loiset has seen it occur), the animal is stiff behind; he is lame on one or both feet; he puts his foot on the toe only; knuckles at the

fetlock; and presently an atrophy of the muscles of the superior regions takes place.

II.—*Progress, Duration, Termination.*—The disease generally maintains a steady progress; nevertheless it very often undergoes a remission, due to the hygienic conditions in which the animal is placed; to the seasons; to the state of the atmosphere, and to other causes. It may diminish in severity, and its symptoms disappear, while in its first period, if the animals are left at rest—without shoes if possible—loose in a box, with damp bedding, or in a marshy field; or in winter, during the rainy season, while the atmosphere continues in a moist condition for a long period. It is, under these circumstances, not uncommon to see feet which had become contracted quite recover their natural dimensions. Aside from these exceptional cases of recovery, the lesion keeps on slowly destroying the tissues where it exists; the lameness remains constant, or becomes intermittent for years, sometimes after the animals have become entirely unfit for work. There are frequent complications involving the surrounding parts; sometimes a true arthritis, and besides the complete atrophy of the muscles of the shoulder, the carpal ligament becomes thickened, the tendon of the perforans undergoes the same alteration, and ring-bones and side-bones may follow. Again, however, the animal may become knuckled to such a degree that he can scarcely rest his foot on the ground at all.

III.—*Pathological Anatomy.*—As we have said, the disease has its seat in the synovial capsule, formed by the small sesamoid sheath between the navicular bone and the perforans tendon, sliding upon it. At first may be observed a certain injection of the synovia, and a darker hue in the coloration of the trochlear cartilage with the corresponding face of the tendon, the synovia becoming reddish and thick, the surrounding cellular tissue becoming, also, inflamed and infiltrated. At a later period, when the disease has somewhat progressed, there is a thickening of the walls of the capsule, which is then filled with a clear citrine serosity. There is then, a kind of hygroma, a chronic dropsical condition of the sheath. In the interior of this are found fibrous bands, running from the tendon to the bone. If the disease is older,

erosions are found upon the diarthrodial surface of the navicular, varying in number and in size, and the tendon is roughened on its anterior face, with longitudinal fissures. At times, it becomes atrophied and thin, dry and brittle; and has been found, it is said, ruptured transversely. In many cases, the cartilage covering the bone has disappeared and the bone is exposed, hollowed and affected with osteoporosis. The union of the bone with the tendon has also been found among the varieties of determination.

IV.—*Diagnosis*.—This disease is at first easily mistaken for some form of rheumatic affection. Where pain is the main symptom it is easily detected, but where there are no other signs of inflammation, it is just the lack of proportion between the intensity of the lameness and the serious symptoms, such as the absence of heat; of special sensibility; of pulsations in the digits, which distinguishes navicular disease from other affections of the feet. The error with contracted heels is easier, as here the change of form of the foot being primitive, at once attracts the attention of the practitioner; while this alteration in the foot is absent in navicularthrititis at the outset of the disease.

V.—*Prognosis*.—Generally, it is unfavorable, as most commonly the veterinarian is called only when the disease has already made serious progress and passed into the chronic stage; and again, because of the difficulty of reaching the disease by reason of its peculiar location.

VI.—*Etiology*.—To properly understand the etiology of this disease, one must bear in mind the part played by the anterior legs in the action of locomotion. Columns of support more than of impulsion, it is their office to sustain the weight of the body when it is thrown forward by the extension of the hind legs. The reaction of the ground is first felt at the shoulders, through the muscular slings which attach them to the trunk, but it is partly diminished in the scapulo-humeral joint, which closes, notwithstanding the resistance of the muscles implanted on its apex. The remaining force is transmitted to the vertical column, represented by the union of the radius, the carpus and the metacarpus. Reaching the digital region, this force is there decomposed. Part of it, passing on the phalanx, loses itself and disappears in

front of the horny box of the foot, the other being thrown upon the flexor tendons, and finally upon the perforans, which distributes it to the posterior parts of the foot, and to the navicular bone. It must be observed that in this complex action of decomposition of the shock, the os sesamoid, though pushed from before backward by the os coronæ, is, however, supported by the resistance of the perforans tendon. Consequently, both the bone and the tendon are pressing upon each other, when the feet are placed on the ground, throwing the body forward by the impulse of the hinder parts, and thus press powerfully against each other.

When this pressure takes place in an animal going full speed, and a good and high stepper, it may commence by becoming merely a slight contusion, but, if often repeated, the result may be some lesion upon the corresponding surface of the bone and of the tendon, or of the synovial which facilitates their movements. But the energy of action in the animal cannot be considered the only producing cause of these lesions, as a vice of conformation in the foot, a want of elasticity in its posterior parts where the resisting power is diminished, may also produce it. The disease, then, is observed in animals whose plantar cushion, covered by a small, dry and atrophied frog, is itself badly developed, from being compressed between the bars, which are more vertical, or the heels, which are more contracted; all these being conditions which diminish the flexibility of the back of the foot.

Two principal causes, then, co-operate in the genesis of navicular disease, and are almost always present in animals thus affected. On the one hand, it will appear amongst well-bred animals, especially those of English breeds, those from Hanover, Mecklenburg and Normandy, which will be more affected. Loiset and Lafosse, however, have seen it in common breeds, in animals with flat feet and soft horns. Lafosse says he has seen it in mules. But besides this influence of the breed, there is the effect of what we may denominate the hygiene of the foot: the too dry bedding, certain wrong modes of shoeing and all the predisposing causes of contracted heels. Let us add also, as a cause, the effect of changing the animals from marshy fields, where they were walking on soft, damp ground, to stables with dry bedding—

a cause commonly present in horses transported from Northern Germany to the south. Hard work and excessive exercise are also causes of this affection—for example, jumping fences with a heavy rider, slipping in steeple-chases, racing, a sudden stop on the forefeet, especially on stony, hard, frozen or rough grounds. All these are fruitful causes of navicular disease.

Traumatic causes, such as punctured wounds, involving the sesamoidal sheath, are also productive causes which may originate navicular disease. We do not believe in internal causes, nor admit, with Loiset, that visceral inflammation, sudden arrest of perspiration, especially of the lower part of the legs, can produce the disease. We should rather anticipate that these metastases would affect more the more important serous structures. Neither can we admit, with Lafosse, that this affection can also follow a sudden arrest of the milky secretion.

VII.—*Treatment*.—We have seen, in speaking of the terminations of this lesion, that in certain peculiar circumstances which may be accounted favorable to the return of the elasticity of the foot, a spontaneous recovery is possible. This leads us to the measure of the prophylactic means proper to be used; and it seems evident that by a better hygiene of the feet, by rational shoeing, sometimes by putting young horses only gradually to fast work, one may, in many cases, avoid navicular disease.

While it is in its first stages, one may with care and patience, sometimes relieve the patient. In this case, absolute rest is counter-indicated, but on the contrary, moderate exercise, upon even and not too hard ground; or, if the lameness is great, walking exercise only, at a moderate gait. The absorption of the serosity present is made easier by a little exercise, than by absolute rest. Bleeding from the toe, or the veins of the affected legs, is also, at least, superfluous, the disease becoming chronic almost at the outset. It is also a good practice to shoe the horse, and above all, to remove the shoe frequently. The best shoeing is that which allows for the natural expansion of the hoof. The Charlier shoe has proved useful, while the bar shoe, which is heavier, and presses upon the frog, is counter-indicated. It is important to encourage the suppleness of the hoof by proper ointment, especi-

ally the application of glycerine, and to have under the feet a bedding always slightly damp and soft. The bedding of moist saw-dust is very convenient; we prefer it to poultices, and even to the tepid alkaline baths mentioned by Hertwig. At times, at intervals of about eight days, and then during two consecutive days, a good friction with blister ointment above the coronet is advantageous, as well as one with Lebas' ointment. English practitioners prefer salines; the better treatment would be to turn the animal to grass. Brauell advises iodine internally, and says he has found it work well. Others recommend diuretics. Setons in the shoulders or chest, seem to us inexpedient. We prefer the administration of a purgative ball every eight days. Sewell and Brauell advise a seton, running from the hollow of the coronet through the plantar cushion, a little behind the tendon of the perforans, and within a short distance, therefore, of the diseased capsule, making its exit at the anterior third of the frog. This drain is to be maintained for two, three, and even four weeks; Sewell, Brauell, Hertwig, and several other veterinarians, English especially, claiming much benefit from it. This seton is introduced by means of a curved frog seton-needle; it has been used but little in France. Bruner has recently proposed the puncture of the sesamoidal capsule with a trochar, introduced in the hollow of the coronet, an operation only practicable if the serous collection can be felt outwards. After the puncture he recommends an injection of iodine.

Lafosse proposes after the removal of the sole, the transversal incision of the plantar cushion, with removal of a part of it, down to the tendon, following the axis of the sesamoid; then the cauterization of the bone and its cartilage, in imitation of what is sometimes done in punctured wounds of the foot. Brauell recommended as a useful surgical operation, the section of the perforans tendon in the metacarpal region, in order to prevent friction against the sesamoid groove, and to allow an easier adhesion between the tendon and the bone. But it is to be feared that this section, supposing that it proves successful, might so weaken the tendon as to render the animal unfit for fast work.

If navicular disease should be accompanied with deviation of the wall, and contraction, true or false, the treatment will be that

of this affection in its simple form. An operation, often recommended, has been that of neurotomy, upon the posterior branches of the plantar nerves, repeated at intervals of at least fifteen days, in order to remove the lameness wholly, without entirely depriving the foot of the sensibility of feeling. Berger, Brauell, Bouley, Gross, Mandel and others, have obtained real success by it; but it is attended with serious dangers; at any rate the benefit is not of long duration, or about one year. The animal then stumbles more readily, and is more exposed to traumatic lesions, etc., and it is probable from this cause that double neurotomy is seen to be followed by softening of the deep parts of the foot, suppuration, sloughing of the foot, while the animal has previously shown no signs of pain. Consequently, neurotomy is an operation which finds its application only in peculiar and exceptional cases, and animals thus operated upon remain fit for light work only.

QUITTOR.

SYNONYMS.—*Fesselgeschwür*, German; *giarda*, Italian; *giarlars*, Spanish; *javart*, French.

A name of unknown etymology, by which old hippiatrics designate various affections of the inferior regions of the legs of the horse, donkey and mule, and even of bovines. These possess the common character of a degeneration of a portion of the tissues, that is expelled by the efforts of nature under the form of a slough (*bourbillon*). There is a softening of the mortified structures, and an elimination by suppuration. In several old works these sloughs are called quittors, (*javart*) and this name has been extended to the disease itself.

This name having been preserved by use, notwithstanding the efforts of Vatel in opposition, we shall also employ it, and with Girard, recognize: 1st. The *simple* or *cutaneous* quittor, which is only the furuncle which occurs in the thickness of the dermoid structure nearest to the coronary band. 2d. The *tendinous* quittor, which greatly resembles the felon of man, where a portion of the sub-cutaneous cellular tissue, and of a tendon sloughs out. 3d. The *sub-horny* quittor, the furuncle of the cuticula of the coronary band itself, the slough involving the superior

portion of the laminated tissue. 4th. The *cartilaginous quittor*, or the limited caries of the lateral fibro-cartilage of the os pedis, and which old writers compounded with the horny quittor. We might join to those the furuncle of the frog, (see vol. 6, page 204). We believe it useless at present to enter upon a general consideration upon quittor, and will proceed to examine the pathological phenomena presented by each variety.

A.—*CUTANEOUS QUITTOR*.—This is a simple furuncle of the coronary region of the foot, in that part of the dermis nearest to the coronary band, having, however, a special character on account of the extraordinary thickness and inelasticity of the dermis of the region it occupies, the result being a kind of strangulation of the inflamed tissue beneath, and a very painful compression. It is through error that some authors have designated by the same name, the furuncle of the canon, of the fetlock, and of the coronet.

The hind feet are more subject to it than the fore, and it is more frequent at the heels, at the flexure of the fetlock, though it is also observed on the sides and front of the coronet, in which case it is much more painful. Cutaneous quittor has also been observed in bovines, where, however, as we shall see as we proceed, it is generally complicated with the tendinous variety, and becomes a true felon.

I.—*Symptoms*.—Cutaneous quittor is characterized by an inflammatory tumor or swelling, warm, painful, and tense, of the coronary region of the foot, the color of the skin being but little changed, if it is dark, but if the skin is light then the redness is well marked. This swelling is accompanied with a diffused œdema, extending to the fetlock, or even to the hock. We often find angioloecites, or rather what we call leucophlegmasiæ. The lameness is generally extreme, and the animal frequently can scarcely rest on the diseased leg. The pain is sometimes so great as to induce general fever and loss of appetite, and the animal becomes dull and depressed. After acquiring certain dimensions the tumor shows a tendency to soften at its summit, its base, however, remaining hard for a considerable time. Rising more and more, it soon ulcerates at a point from which flows a small quan-

tity of bloody pus, followed by the appearance of the slough, (*bourbillon*). An abscess is now formed in the tumor, which, as it opens, carries with it a portion of the skin, sometimes limited, at others measuring from four to ten centimeters, and there is a slough formed of the subcutaneous cellular tissue which separates by the suppuration with the portion of dead skin. This comes out by degrees. It is still adherent by its base and cannot be pulled out with the forceps unless by tearing and with acute pain, and this is often followed by slight hemorrhage. A few days later it will, however, become entirely loose, and in its place there will remain a cylindroid open cavity extending through the tumor, from its summit to its bottom, and from this a deep wound results, followed by a sero-bloody secretion, mingled with pus. As soon as the slough has taken place, or when it begins, the lameness subsides, as well as all the other phenomena of the pain. The wound heals up rapidly if there is no complication.

Cutaneous may easily be complicated with tendinous quittor if the disease or process of sloughing of the mortified tissues extends to the tendons or ligaments of the region involved. This complication is specially common in bovines, where cutaneous quittor generally gives rise to more swelling and greater suffering than the horse.

This quittor has quite a rapid progress, and may last from eight to fifteen days; very seldom longer. At times it seems to be a single furuncle; at other times there are several existing together. Often again, they come in succession, the first one treated being soon followed by others. This is said to take place principally when the diseased part remains exposed to the action of irritating substances, and relapses are prevented by protecting the part from the effects of these occasional causes.

II.—*Pathological Anatomy*.—It is an inflammation of the very abundant sub-cutaneous cellular tissue of the region, spreading from a starting point; the inflamed tissues are mortified and become gangrenous, and by a process of suppuration, the economy attempts to eliminate them. The slough represents more particularly the inflamed cellular tissue, which is thickened, and which has become filamentous and hard and much impregnated with purulent serosity.

III.—*Etiology*.—Contusions of the region, bruises and punctured wounds are quite frequent causes of cutaneous quittor, but it may also take place without evidence of determining causes. Mud, manure, urine, all filth in which animals have to walk or remain, are also considered as causes. For this reason the disease is more common in the fall and winter, on account of the action of cold at times, and frozen mud. It is also more frequent in cities than in the country. Ray observes that the mud of cities is always more irritating and contains mineral substances, especially lime, alkalines and salts, and other substances. The gutters of some industrial establishments have also a direct irritating action. D'Arboval has observed that the mud of places where mineral springs exist is more irritating, as also are calcareous soils, where cutaneous quittor is more frequent than in any other. Common, large horses, notwithstanding their thick skins—or, rather on that account and on account of the hair which covers it—are more commonly affected than private horses. Towing horses are much more exposed to the disease than those otherwise employed.

IV.—*Treatment*.—As a first direction, during the course of the treatment it is always a prudent rule not to work the animal and to keep it in the stable, the feet being kept dry on a good bedding. An internal treatment is seldom necessary to control the general symptoms; if any is required, ordinary salines will generally be sufficient. It is necessary to assist the process of suppuration of the abscess by emollients, warm baths, poultices of flaxseed or of marshmallows, with melted lard, applied quite warm, or by the application of a mixture of honey and bran or flour. We have applied a coating of blister ointment to the tumor, covered with a warm poultice; the maturing effect is then very rapid. It is often necessary to lance the tumor to reduce the pain and prevent the mortification of a large piece of skin. This operation is recommended by D'Arboval and H. Bouley, and is specially indicated when the tumor is much developed. It is then important to incise in the entire thickness of the dermis and to a sufficient length, and if necessary to make several parallel incisions which will give rise to a copious flow of blood. In this mode the parts are relieved, the pressure of the tumefaction

is reduced and the gangrene diminished, if not entirely prevented. It is necessary—and we insist on this point—to incise so deeply that the tumefied skin is divided in its entire thickness. We have seen blacksmiths thus operate by the introduction of points of cauterization in the summit of the abscess; but this mode, though facilitating the sloughing of the strangulated part and reducing the compression, ought not to be preferred to the incision with a sharp instrument—cauterization is more painful.

When gangrene exists and the abscess is open, the incision is certainly less efficacious than at the outset, but it is not for that reason useless, as it relieves the pain and prevents excessive compression. We do not by it attempt to loosen the slough, which it is advantageous to have detaching loose itself when it holds only by its base. If the abscess, once formed, is slow to ulcerate, making a point of cauterization is a good way to stimulate the escape of the matter of the slough. This mode of opening produces in the part an increase of vital action and forms a sore of benign character, which falls off by the effect of the suppuration formed underneath, and which is nearly always followed by a comparatively speedy recovery. To obtain this radical cure it remains to continue the use of the ordinary means to facilitate suppuration and bring on resolution. If the wound is pale and covered at the bottom with large granulations, it must be dressed first with basilicon ointment and afterward with alcoholic liquids, as spirits of camphor, tincture of aloes, or simply an aromatic infusion; at times baths of sulphate of iron, with a little sulphate of copper, are indicated; or, when the wound has become red, the granulations vascular and of healthy character, a simple dressing of ægyptiacum ointment, diluted in vinegar, is enough. If proud flesh develops itself, it must be cut off. It is important to have the wound covered with a protecting dressing, which must be renewed daily if the suppuration is very abundant, or it may sometimes be left on for two days.

B.—TENDINOUS QUITTOR.—SYNONYMS—*Hornburne* (Germ.)—It is the nervous quittor of hippiatres, and the analogue of the felon of man. It is again a furuncle, different from the preceding, only because instead of being limited to the skin and subcuta-

neous cellular tissue, there is caries of a portion of the tendons (especially the flexors), or of the ligaments of the region, and also, at times, necrosis of the bone with synovitis and arthritis. By extension, though we think, improperly, the name has also been given to the felon of the region of the cannon, while the application ought to be confined to that of the digital region, situated in the fold of the fetlock.

The quittor may be superficial or deep-seated when it affects only the subcutaneous cellular tissue, uniting the skin to the tendons, or where the inflammation extends to the phalangeal sheath, and the pus accumulates into it. Differing from cutaneous quittor, this form, generally less common, is more frequently seen in the anterior than the posterior extremities. It may also be seen in cattle.

I.—*Symptoms*.—The first symptom is an excessive lameness, manifesting itself even where no visible change exists in the affected leg. The animal evidently suffers great pain, while his actions do not aid us in localizing it accurately, though the foot is always examined as being the probable seat of it, the animal raising it more rapidly than the other from the ground, and resting on it with much caution and hesitation. After from two to five days a phlegmonous tumor appears at the coronet, above the heel. It is extremely warm, and much more painful than that in cutaneous quittor, the hoof and the skin preventing the free development of the inflammation by strangulating it. The foot almost ceases to rest on the ground, but is flexed and raised from it, feeling in the parts being very painful. The swelling of the leg extends to the fetlock, or to the cannons, and even to the knee. The animal has more or less fever, and when there is a deep quittor he loses all his appetite, and ordinarily lies down and continues in the recumbent posture.

Generally, much time is required for the phlegmon to assume the character of an abscess, as the slough, being in this case no longer formed by the cellular tissue, is slower to define itself. The process of suppuration is not so well localized; there is, on the contrary, a kind of deep abscess, which probably becomes complicated by the resistance opposed to the ulcerative inflamma-

tion by the aponeurosis of the sheath and the thickness of the skin. However this may be, it is always very difficult to recognize the presence of one or several of these abscesses, even when they form in the subcutaneous cellular tissue, and so much the more if the purulent gathering is deeply seated.

After the opening of the abscess and exfoliation of the slough, either with or without the dropping of a portion of the skin, there does not remain the simple wound of the cutaneous quittor, but on the contrary, a persistent fistula, running down a necrosed point of the tendons or of the fibrous sheaths. At times, almost from the outset, we may observe in the fold of the coronet numerous little pimples, which terminate in as many deep fistulæ, from which ooze a more or less thick humor, fœtid, puriform and bloody. In infrequent cases, the disease is unaccompanied with suppuration, and there is a swelling, more or less hard, with a gradual diminution of the pain and other inflammatory symptoms. A more frequent complication is the suppurative inflammation of the tendinous sheaths, or even of the digital articulations. There may also be a diffused gangrene, with separation of the hoof and purulent infiltration under the horny box; periostitis, and caries of the cartilage. This is the deep tendinous quittor in the most severe form. In this last case, especially if there is an accumulation of pus in the tendinous sheath, the tumor is very painful, the slightest touch giving rise to the manifestation of extremely acute suffering, the hoof being constantly raised from the ground. The fever is violent, there is a complete anorexia, and the exercise of all functions is more or less disturbed. The compulsory resting upon the healthy legs may give rise to swelling of the hocks, and even to laminitis. In cattle, tendinous quittor becomes more painful than in the horse, and is always accompanied by a swelling which may extend to the knee. Rumination stops, and the animal endures great anguish. The slough is followed by a wound of varying depth, which often exposes the diseased articular surfaces of the phalange. If this remains too long, the pus may affect the inter-digital ligament, complicate the disease, and even make it incurable. In this case the amputation of one of the digits may sometimes be performed.

II.—*Progress, Duration and Termination.*—The duration is generally protracted; the disease often gives rise to chronic lesions difficult to remove. This will be easily understood, if we remember that the region affected is composed, between the skin and the bones, of synovial capsules, ligaments, tendons and aponeuroses, more or less cellular tissue, and of very strong nervous ramifications. If the disease is not very deeply seated or unilateral, complete recovery may be looked for; but if there are chronic lesions, if the articular surfaces become affected; especially if particles of bone are sloughing, if the animal recovers it will be but imperfectly, and it will usually be accompanied by ankylosis of the joint, and diffused gangrene is also a complication to be looked for.

III.—*Diagnosis.*—We said at the beginning that tendinous quittor is a very obscure disease; the lameness is very great, but not characteristic; in proceeding, we referred to the acute local pains at the side of the tendinous cord of the cannon, the inflammatory swelling, the increase of local pains, and the general reactive fever.

IV.—*Prognosis.*—It is a very serious disease, on account of the possible complications and sequelæ. The loss, or the deformity of a phalanx, which are sometimes among the sequelæ of the felon of man, are in him, accidents which never give rise to serious complications, or are quickly forgotten, while in the horse such complications are equivalent to the death of the animal.

V.—*Etiology.*—The causes are the same as those of a simple quittor which is complicated with the tendinous kind; this is also observed after the subcutaneous abscesses, frequently resulting from bruises, or even from punctured wounds. It is most commonly met with in low bred horses and Fisher says that it is more frequent, and less malignant, in young than in adult animals; according to this writer it is a common manifestation of distemper. Irritating muds favor its development in the same manner in active as in simple quittor. It often appears without appreciable causes.

VI.—*Treatment.*—When tendinous quittor is superficial it requires about the same treatment as the simple kind, except

that in this case the counter openings must be made early to prevent the sloughs, migrations of the pus and the gangrene. The surgeon must not forget that the inflammation in this affection must ordinarily terminate by suppuration, and he must bear in mind that there is a possibility of the modification of the inflamed cellular tissue, and that the mortified portion of that tissue must slough out, as their presence too long continued may be very dangerous. The general indication is to prevent, as much as possible, the accumulation of the pus, an indication which will be best fulfilled by making openings for its escape, even before the formation of the abscess. As the tissues which surround the pus are very resisting, nature will not be able, or if so, only with great difficulty, to effect the expulsion of these matters. It is for this reason that it is necessary to assist her operations by making an opening for the escape of the pus and of the slough. The operation is without danger; but if it is not performed in good time the lesions will be likely to spread, the disease cease to remain a local trouble, and the life of the animal become compromised.

It is also more necessary to make an opening when the purulent secretion is established, for in this case it is important to avoid delay and to facilitate its escape. A simple longitudinal incision, four or five centimeters long, is sufficient, when the collection lies immediately under the cutaneous organ. This incision must involve the whole thickness of the skin, as far as the tendons, and should be made in the middle of the coronet region, as near the foot as possible. It gives rise to an abundant hemorrhage, which relieves the part, and warm poultices and baths, to accelerate the suppuration, are then indicated.

When the product of suppuration has passed in the tendinous sheath, a longitudinal opening of this part towards the most dependent points, is indicated. To do this, a canulated directory is introduced to guide the bistoury; when the incision is made, the pus flows freely, and by this mode the large blood-vessels and the various ligaments of the region are avoided in the operation.

Notwithstanding the incision, or if the suppuration had

already accumulated before it was made, the pus may also accumulate in the pouch formed by the tendinous sheath behind the tendons. It is then very difficult to prevent its collection in those deep parts, and it may extend to the small sesamoid. It is because the pus cannot run towards the skin that it filtrates along the tendon. It is only by pressure and by injections that the indications presented can be fulfilled. After making free incisions, one may try by pressure to remove the pus accumulated between the tendons and their sheaths, following it by cleansing injections, which must be repeated as often as possible.

The wounds which remain after the slough, in the superficial tendinous quittor, and that which follows the opening of the simple or multiple abscesses when it is deeper, are always characterized by the presence of fistulas running down to some necrotic spot of the tendons or of their sheaths. For these an injection is recommended of tincture of aloes, tincture of iodine, and sometimes of Villate's solution; lately, dressings with petroleum or phenic acid have been used. Phenicated baths, those of sulphate of iron and lotions of permanganate of potash have also proved useful. At times, when the fistulas are persistent, it is necessary, after enlarging them, to have recourse to actual cauterization with a pointed cautery introduced, while at a white heat, down to the bottom of the tract. A general dressing of the wound follows, with tincture of aloes, sometimes with egyptiacum. The dressings should be more or less frequent, according to the quantity of the pus discharged. We must dress until the wound is entirely healed, and it must moreover be carefully watched for fear of another infiltration of pus, or the formation of other fistulas.

Superficial cauterization is necessary in order to remove the induration and swellings likely to follow, and to stimulate the resolution. The action of the firing may be stimulated by blistering, or by an alterative ointment of iodide of mercury, of sulphur, &c.

C. SUB-HORNY QUITTOR.—This is the inflammation of the superior part of the keratogenous apparatus, of the cutidura; or even of the superior parts of the sensitive laminae. This quittor is, therefore, located under the horny box, and is more like the

cartilaginous kind, which old hippiatrics, and especially Sollysel and Garsault, describe with it. It generally takes place on the quarter, and more seldom at the toe, or at the mammiæ. Sometimes it is observed at the heels, but it is then of small consequence.

I.—*Symptoms*.—The lameness is very great. The animal walks on three legs, and there is strong reactive fever, due to the excessive pain,—this form of the disease being more painful than the others, in consequence of the pressure of the horny structure upon the inflamed tissues. At the origin of the nail a warm and very painful tumor is found; the foot is hot and the hairs staring on the site of the injury. If the disease has existed for some time, there is a separation of the hoof at its origin, due to a sero-purulent exudation, and under the hoof suppuration and mortification of a more or less extensive portion of the coronary band, or of the laminae will be found. The suppuration which there exudes varies, being in rare instances blackish, as it is usually found in traumatic injuries of the hoof; or, again, it is white and unctuous, with the odor of decaying cheese; while more commonly it consists of a bloody or greyish matter, mixed with pus.

If the mortified portion is not deeply seated, so that the slough can take place readily, the quittor is quite simple, since as soon as it has dropped off there is a well marked improvement. The pain then ceases almost instantaneously, and the wound at once progresses towards cicatrization. But it is not rare, even when the mortification is somewhat superficial, to find the sub-ungueal suppuration extending so that the matter runs under the hoof, producing at times a more or less serious fistula, or a separation of the sensitive and insensitive laminae. Girard says it has been seen to extend down to the sole, and to separate it from the velvety tissue. The deep sub-horny quittor may be complicated, forward, with necrosis of the tendon of the extensor muscle; with the inflammation of the joint with caries of the os pedis, and even to assume the cartilaginous form of the disease by its extension to the cartilages of the foot.

After the recovery of the sub-horny quittor, if the coronary band has been mortified in its entire depth, the foot may present permanent longitudinal fissures, or seams, or transversal grooves,

presenting evidences of the existence of a cicatrical tissue when the quittor was in progress.

II.—*Prognosis*.—The gravity of this quittor depends upon the depth of the disease. When superficial and affecting only the surface of the tissue, it is easy to cure, but if deeply seated it is more serious, on account of the possibility of complications.

III.—*Etiology*.—Bruises and violent blows are the ordinary causes of sub-horny quittor. It is commonly due to overreaching, or to the wounds occurring when animals are wearing long caulks, as in winter. The irritating effects of frozen mud has also been admitted as a cause.

IV.—*Treatment*.—The superficial quittor requires a simple treatment. Emollient baths and maturing poultices are then indicated. It is a good plan to thin the wall with the rasp or the sage knife over the whole extent of the furuncular tumor to a height of about two fingers. Compresses of chloroformed oil, while it alleviates the pain, are also indicated to soften the wall. It frequently becomes necessary to puncture the tumor, but we prefer to cauterize it with a pointed iron, following the cauterization with a poultice of honey with Venice turpentine or camphor. Some authors recommend astringent baths, as oak bark, or of sulphate of iron. It is often the case that after some interval following sloughing of the *bourbillon*, the wound continues to discharge a liquid secretion, which is an evidence that there is a tendency to accumulation of matter towards the lateral cartilage, or under the wall, in the laminae; or that there is some carious spot existing. In the first, if probing horizontally, a cavity is detected, it is convincing evidence that a cartilaginous quittor is in course of development; in the second case, the pressure and collection of the matter increases the inflammation of the laminae, separates the wall, and complicates the disease, necessitating the *operation of the sub-horny quittor*.

The removal of the portion of the hoof which covers the lesion, must, however, include more than the purulent center, so that the diseased tissues may be well exposed and the suppurative process detach them readily. This removal, always proportioned to the internal lesions, is made either lengthwise, following the

direction of the horny fibres, or crosswise. In that case, it will attack only a portion of the wall towards its point of union with the skin. This latter method, it is true, requires less cutting, but it has several quite serious objections and often necessitates a second operation. Even in cases where the growth of the granulations can be controlled, and where a good return of the horse is obtained, the hoof only recuperates its perfect integrity by the slow growth downwards of the wall. In some circumstances the operation is completed by the removal of a portion, or even of the entire mass of the sole, when it is separated from the velvety tissue.

The removal of a portion of the wall must be accomplished in the manner which will be indicated for cartilaginous quittor, in carefully avoiding the injury of the coronary band and of the podophyllous tissue. The diseased tissue being exposed, all that is of bad appearance is removed, the carious portion being freely taken off. An ordinary dressing of oakum with diluted alcohol, or any other drug, kept in place with a light shoe or slipper, entire or truncated, as the case requires, is then applied.

As for all wounds of the foot, the dressing needs only to be changed when the pus accumulated under the oakum or other peculiar conditions indicate it. It is true that changing the dressing is an effective means of cleansing the wound, but it has also the inconvenience of also irritating it, and especially at the beginning may tend to interrupt the natural process of repair. It is of advantage, after the first dressings, to change them as infrequently as possible. In this way hemorrhages, which may always be looked for, are avoided. This is a point of the first importance. It has been proved that even in operations where a portion of the wall has been removed, a dressing left on for from fifteen to twenty days without removal, was followed by rapid recovery, the new hoof growing under the oakum without supuration. It is useless to probe or wipe out the surface of the wound. On the second dressing, that is, after a few days, the parts begin to be covered with numerous white points, which are so many rudiments of hoof. These, which at first are soft, white and isolated, gather together by degrees, at first unite into a thin

layer, soft and yellowish. This becomes hard and thick; it is the hoof secreted by the laminæ, which, little by little, unites with that coming from the coronary band. Excessive granulations or proud flesh are removed in the ordinary way.

D.—CARTILAGINOUS QUITTOR.—*Hufknorpelfister*, (German)—(*improperly called sub-horny quittor* by Lafosse, Jr.; *coronary quittor* of Vitet; *fibro-chondritis* of the third phalanx, by Vatel; sub-horny cartilaginous quittor of Girard; quittor proper of Delwart). This form of quittor is peculiar to solipeds, they being the only animals which have fibro-cartilage on the os pedis.

These fibro-cartilages are two pieces, which, with the plantar cushion, complete the os pedis and form the base of the heels, each representing a piece flattened sideway, parallelogram in shape, and extending posteriorly to the coffin bone. Their external face is convex and pierced with foramina for the passage of veins and slightly overlays the surface of the bone of the foot. It is separated from the skin by a very rich vascular plexus. The internal face, concave, is hollowed by vascular grooves and covers, forward the articulation of the foot and the cul de sac of the synovial sac which protrudes between the two lateral ligaments of that joint. Downwards and backwards it is united to the plantar cushion, either by continuity of tissue, as near the inferior border, or by fibrous bands running from one to the other. The superior border, either convex or straight, is thin, and separated from the posterior by an obtuse angle in front of which it presents a deep notch for the passage of the blood vessels and nerves. The inferior border is attached, forward, to the basilar and retrosal processes of the os pedis. Behind this it reflects inwards, to continue to the inferior face of the plantar cushions. The posterior border, oblique, backwards and downwards, is slightly convex and unites with the preceding. The anterior border, oblique in the same direction, is more intimately united to the anterior lateral ligament of the articulation and can be separated from it only by artificial dissection. It sends upon this ligament and upon the anterior extensor of the phalanx, a fibrous extension, which unites with that of the opposite side.

In their structure the fibro-cartilages comprehend a mixture of

fibrous and cartilaginous tissue, a mixture which is far from being homogenous and even in the various parts. The more it is examined forwards and near the base, the more its substance is seen to resemble that of cartilages proper, being white, flexible, brittle, and homogenous. Towards its posterior part it loses its characters of homogeneity, becomes less brittle and presents in its thickness a greater amount of fibrous texture. More posteriorly again, the fibro-cartilaginous structure is more marked. By close attention it seems to show cartilaginous nuclei, isolated, and surrounded with an entirely fibrous substance; and again, at its posterior extremity it becomes fibro-greasy with much cellular tissue and unites with the plantar cushion. The vitality of the cartilage is in inverse ratio with its density and consequently is greater in its posterior part than towards the base and its anterior extremity. This fibro-cartilage may easily and more or less completely become ossified; old horses are those which most commonly present this condition, and draught horses are more subject to it than those used to the saddle. It may assume various forms. At times it occupies the entire extent of the cartilage, and others only at its base; sometimes the external surface is ossified, while the internal remains in its normal structure; then again the ossification exists only anteriorly while the posterior is cartilaginous, and it more rarely happens that the process consists in bony lamellæ, which, starting from the base, spread towards various points of its circumference.

These fibro-cartilages are generally more developed in the anterior than the posterior extremities. They also present, in one foot, this slight difference, that the internal stands a little higher than the external.

Cartilaginous quittor is a serious affection characterized by the partial caries of one of the fibro-cartilages; it is a partial gangrene whose character is to slowly spread into the cartilaginous structure upon which it starts. To be treated with success it requires a very regular attendance, and often an operation, which consists in the removal of the cartilage. Sometimes this operation is indispensable, and its study is interesting, especially because, though not as commonly performed as at the beginning of

this century, it is one which requires a high degree of surgical skill for its success.

I.—*Symptoms*.—A division has been made of an *acute* and a *chronic* form of this disease. Under the first name, is considered the earlier period of the affection, that in which there is inflammation of the cartilage and painful swelling of the part, and when the caries or necrosis of the fibro-cartilage is not yet established; or if there is a wound, when it does not yet granulate, and the suppuration, if it exists, is very slight. Chronic javart would be that in which the partial and progressive mortification of the fibro-cartilage exists; for, as Renault has said, it is the ordinary termination of fibro-chondritis.

When free from serious complication, the disease is generally accompanied with but little lameness; sometimes there is almost none, and animals can be kept at work, especially at a slow gait; but if made to trot, the horse will show lameness. It is especially when the quittor exists in the posterior parts, that the inflammation and the pain are not excessive, because there is there an abundance of soft, fatty tissue. But when the caries is more forward, and is situated more deeply, in a point nearer the articular surfaces, the lesion then affects the fibrous tissues, and the pain is greater. It is sometimes excessively acute.

Upon the lateral part of the coronet, towards the heels or the quarters, a more or less developed tumefaction appears, more or less painful, according to the duration of the disease, and in this case more or less indurated. In the centre there exists a granulating fistulous wound. There are one or several fistulæ, whose openings shows granulations, bleeding easily, their course always forward, running at times in straight lines, at others irregularly. The tracts frequently communicate, and discharge a granular, serous and thin pus, of pale greyish color, generally odorless, or slightly sanious, containing greenish particles, which are but pieces of diseased fibro-cartilage. This pus dries up on the surface and adheres to the hoof and to the hairs, and some times irritates the surface of the skin. If one of these fistula become cicatrized, a fluctuating tumor soon appears, close to it, which rapidly ulcerates, and then gives rise to another fistula.

If the disease is quite old, the hoof of the quarter corresponding to the necrosed cartilage, loses its perioplic band, becoming rough, ramy and cracked, and the wall is thickened, because the irritation of the coronary band has stimulated its growth. This change in the condition of the wall varies with the length of time the disease has existed, and consequently, it indicates its duration quite accurately, when one remembers that the hoof grows downwards about one centimeter in each month.

When cartilaginous quittor is the sequelæ or complication of suppurative corn; of a punctured wound by a nail of the shoe; or any other affection of the foot, the symptoms proper to these diseases are first observed, though the lameness is greater, and the fistulæ of the quittor is evident. Often, however, this, instead of being external and on the coronet, is situated at the inferior part of the foot, at the internal face of the inferior border of the wall, upon the sole, and sometimes connected with the wound of some of those affections of the foot.

II.—*Pathological Anatomy*.—When one examines the cartilage affected with the necrosis proper of quittor, he always finds lesions in proportion to the intensity and the age of the disease. It is seldom, however, that the portions of the cartilage which have undergone the green degeneration, constituting the caries, reaches more than one centimeter in extent; they have the form of a small plate, of a green color, ordinarily elongated, and adherent to the healthy parts of the cartilage by one of its extremities, that which is more forward and the deepest. Others have compared it to the green growth of a seed in germination. The points of the fibro-cartilage which are in immediate contact with the carious portion, have also a slight, pale greenish hue. These are already diseased; there is already a beginning of necrosis; in the remainder of its extent this exfoliation is separated from the cartilage by a reddish, soft tissue, which also lines the inside of the fistulous tract. This fistula, which extends from the necrosed spot to the skin, is but the hollow tract left by the diseased process upon the cartilage, while gradually destroying its substance. Always lined with a pseudo-mucous membrane, by a true pyogenic apparatus, the fistula is often

narrow, sinuous, irregular in its course and in its extent, especially if the disease is of some standing.

Renault, and after him Lafosse, have mentioned a special alteration of the fibro-cartilage which is sometimes met, and which Lafosse looks upon as a step towards recovery. It is a softening of the tissue, anatomically characterized by a loss of the consistency of the cartilage, resembling the case of the cellular tissue becoming indurated, or that of bones deprived of their earthy salts after soaking in weak acids; its yellowish color is then characteristic. It may be noticed during life, and is recognized by a softening in the region of the cartilage, which then yields, giving easily to the pressure of the finger. Besides this, a probe introduced into the fistulous tract readily penetrates into the softened substance. But the true way to diagnosticate this change consists in raising the coronary band or after thinning the wall; then one will see and may feel the true nature of the transformation. Lafosse adds that, in presence of this alteration, the removal of the cartilage is no more necessary, for then the cicatrization is readily obtained by stimulating the sloughing of the necrosed tissue or by removing it.

With cartilaginous quittor there is always plastic infiltration of the cellular tissue surrounding the cartilage. Very often the wall of the synovial capsula of the articulation of the foot is somewhat thickened, and in that case there is less risk of injuring it during the operation.—(Rey.)

III.—*Progress, Duration and Termination.*—Left to itself, the caries of the fibro-cartilage may last for a long time, through difficulty in determining its true nature. Spontaneous cure, however, is not impossible, as Renault proved it, and as many practitioners have seen it, especially in young and healthy subjects, when the disease is mild at its onset and affects parts of the organs where the fibrous element predominates, as in the posterior portion of the cartilage. This fortunate result follows the sloughing of the “bourbillon” which makes its appearance under the shape of a greenish particle.

But, ordinarily, the disease progresses slowly, destroying the cartilage by degrees, and the diseased process ceases only when

the caries has reached the ligament of the joint, which it sometimes also attacks. The tissue of the fibro-cartilages has not the force of reaction possessed by other inflamed structures, and which is so well marked in cellular tissue. A process of suppuration, such as rapidly eliminates the mortified structure, cannot very readily take place in it, and when by natural forces the carious spot is eliminated, and pushed outwards, the surrounding tissues are most commonly already affected. These undergo the same alterations, are eliminated in the same manner, and so until the entire cartilage is destroyed. This process of caries by repitation may last a year.

In its progressive stage, the disease may spread to surrounding parts, such as the os pedis, the plantar aponeurosis, the ligament of the joint, or the sesamoid sheath, all of which may become the seat of inflammation. They are diagnosticated by the greater pain and more marked lameness, symptoms which are comparatively light in the simple necrosis of the cartilage.

Finally, as a possible complication of cartilaginous quittor, one may observe an entire emaciation of the animal, an alteration of the fluids due to a putrid or purulent infection; some authors claim to have even seen glanders and farcy follow it; this is inadmissible.

IV.—*Diagnosis*.—Cartilaginous quittor is recognized only when there is a wound from which escapes the product of the suppuration and of the necrosis. This pus has nothing characteristic, notwithstanding what has been said. If it is thinner than that of a simple solution of continuity of the region, or that of simple quittor; if it is less foetid than that of bony caries; it has, however, of itself some special characters, varying according to the subject and the degree of the disease, and especially resembling much that of sub-horny quittor. If the escape of the pus is slow, and it is desired to carefully examine it, a simple pad of oakum, kept by a few turns of bandages on the fistulous opening, will, when removed, give a sufficient opportunity to recognize its nature.

The probing will often assist in distinguishing the cartilaginous from the simple or sub-horny quittors. In these last, the

fistula is less profound, and does not reach the thickness of the cartilage; but, as in cartilaginous disease, the fistula is often sinuous, it is better to use a soft, flexible instrument, such as a fine probe made of lead. The injection of liquid may take the place of the probing; injected in a superficial tract, it returns outwards directly, while in deeper and irregular fistulæ, it will penetrate more readily. The induration of the coronet, the rough and ramy appearance of the hoof of the quarter corresponding to the fistula, indicate generally a necrosis of the fibro-cartilage; these characters are missing in the furuncle.

V.—*Prognosis*.—In consequence of the tenacity of the disease, this form of quittor is always serious; though this gravity has, in our days, greatly diminished, on account of the means of treatment now in use, which were unknown some thirty years ago. Now, this affection, which was considered by all hippiatres as almost incurable, and which more recently was treated by an operation which rendered the animal unfit for work for several months, can in the majority of cases be cured in about fifteen days.

The prognosis, however, varies and depends on the complication. When there is caries of the ligaments, inflammation of the articulation of the foot, or of the sesamoid sheath, the extirpation of the cartilage itself, done with the greatest dexterity, is not even a warranty of recovery. It remedies only the necrosis of the cartilage, but leaves the other diseased processes to progress in such a manner that the animal remains worthless if he has not to succumb to them. The pain is, besides the other signs, one of the most important points to consider: very acute, it is generally a discouraging omen, and points to the existence of serious complications.

VI.—*Etiology*.—Heavy draught horses are more frequently affected, on account of their peculiar work. The most common cause is a bruise, a blow, a burn, a prick, any wound exposing the cartilage; it is most common on horses drawing trucks loaded with stones, which may drop on their feet and crush the fibro-cartilage. The same cause exists for horses working in extensive works of buildings; in the construction of railroads; and in the shops of mechanic construction.

Owing to these conditions it is also more common in large cities than in the country, and more frequent in stony and temporary roads than in those which are smooth and flat. Flat feet, with low heels, are more exposed than others, as well as those whose hoofs are soft. Quittor is more frequent in the fore than the hind feet, the fibro-cartilages of the fore feet being more developed and more flexible, and because their heels are generally lower than in the hind legs. In some, it is more common on the internal than the external quarters, while with us, it has been the contrary.

It is often a complication of suppurative corn; of punctured wound of the foot, of canker, of simple and sub-horny quittor, of grease, etc., which are then the determining causes of the disease.

VII.—*Treatment*.—When the disease is recent and the quittor acute, and antiphlogistic treatment may be attempted and resolution looked for, baths and emollients are generally beneficial. A good blister has sometimes proved advantageous, and when it is used limited suppuration, with the formation of a simple slough, may take place.

If necrosis is well established, it is an indication of the necessity of a recourse to more energetic treatment, in which case several measures are recommended, including the actual and potential cautery and the removal of the cartilage.

In actual cauterization the necrosed spot is destroyed by a cautery brought to a white heat, applied directly upon it, after it has been exposed by a free incision. It is a simple treatment, and one that has been successful in cases of posterior necrosis where much fibrous tissue was diseased, and principally in young and well-conditioned animals (Lafosse, Sr., Girard, Vatel, Mangin, Renault). Still, this treatment not only often fails, but may even become a means of irritation of the fibro-cartilage, and cause an extension of the necrosis. (Hurtrel, D'Arboval, Lafosse.) In our day this treatment is almost entirely ignored by good practitioners, and the potential cautery more generally adopted.

This had already been employed by hippiatrics. Solleysel principally recommended the use of corrosive sublimate mixed with

aloes; Girard, Barreyre and Bernard also mentioning it. English veterinarians recommend their use very strongly. (White, Blaine, Riding, etc.) These practitioners all used the solid caustic, either in the form of trochise or in powder, and if they obtained good results it required a much longer time than that required in our day by the use of the liquid forms of caustic which are at our command. With the solid form the action was of limited extent, and scarcely more effective than that obtained by the actual cautery; moreover, they frequently injured the healthy structures by irritating them and increasing the inflammation, and thus resulting in serious complications.

As we have said, liquid caustics are largely used to arrest the spread of the caries; they modify the process of decomposition, dry up the suppuration and stimulate the tissues without injuring the healthy structures. This mode of treatment must be credited to Mariage, who in 1847 established the unfailing efficacy of repeated injections of Villate's solution; one of sulphate of copper and sulphate of zinc, 64 grammes of each in 1 liter of vinegar, and decomposed by 125 grammes of Goulard's extract. It is really simply a solution in vinegar of acetate of copper and zinc, holding sulphate of lead in suspension. Villate himself had already used his solution with success by injecting it in cartilaginous quittor as early as 1829, since which time Burgniet, Verrier, Sr., Collignon and others have recognized the benefit of liquid escharotics in the treatment of the same disease. Villate's Solution is not a specific, and cartilaginous quittor has been cured by the injection of tincture of sublimate (10, p. 100), with solution of nitrate of silver (Bernard), with the perchloride of iron, chloride of copper, sulphate of copper and zinc, nitrate of lead, more or less concentrated mineral acids, and especially the rabel water (Collignon).

It is difficult to say which is the more useful of these drugs and which has been most successful. Success has also been obtained with injections of tincture of iodine, phenic acid and even petroleum. It is less the nature of the drug that insures the effect than the mode of using it. We ought also to say that, advantageous as this mode of treatment is, it is not infallible, though Mariage

and others so consider it. It is not to be preferred to the extirpation of the cartilage, an operation which proves successful when all other means have failed.

To obtain a cure by the use of liquid applications it is essential to make injections every day, and even several times daily. These are made with a syringe, carefully adapted in respect to size, with a small canula. The injection must be pushed well in, but must be allowed to escape freely after coming in contact with all the diseased surfaces which it is designed to modify. To effect this it becomes necessary, as the fistulas are sometimes very narrow, and even irregular, to enlarge them, or to make counter openings. Mariage had originally insisted that these precautions were essential to the success of the treatment. H. Bouley and Viseur also strongly insisted upon the same point, viz., that of enlarging the fistula in order that the liquid should not be allowed to remain at the bottom of the fistulous tracts, by which all possibility of the extension of the disease from that cause might be avoided. These enlargements of the fistulas, or counter openings, close, however, very rapidly; as a remedy to which, Hivernat has suggested the introduction into the tracts of little wedges of wood pointed like pencils, for the purpose of lacerating the walls of the fistula, followed by the insertion in them of small setons moistened with Villate's solution. Guerrapain introduced a fine mèche of oakum, a seton in the tract, by means of a curved needle. If the fistula runs downward its bottom is under the wall, and he thins this down and makes a counter opening through the hoof thus thinned. This seton prevents the closing of the counter openings, and enables the operator to push through the injection regularly.

Other precautions are also necessary. One, especially, is rest. The animal must not be put to work. Lafosse says that these liquid caustics act with regularity and cure with certainty. A bar shoe, not pressing on the diseased quarter, is also useful. Emollient poultices are sometimes necessary, after the injection, to diminish the irritation. Mariage also recommends them. If the fistula extends under the coronary band, or the podophyllous tissue, it becomes necessary to thin, or to remove altogether, the hoof of the diseased quarter.

After fifteen days of this treatment, the exfoliation often takes place, and recovery follows. Often, however, twice this length of time is necessary. After the first eight days the pus becomes more abundant, white, and laudable; the tumor softens and diminishes, as the pain subsides. Later, the injections penetrate with greater difficulty, which is a good sign. The injections constantly attack the germ of the disease and leave it without chance to re-form or to spread; the gangrenous structure which develops in the cartilage is changed into an inert substance; the pyogenic membrane of the fistulous tract is stimulated; the process of granulation becomes more rapid; the wound becomes more and more healthy, and the diseased process ceases. If, however, it continues, the wound changes its character; large granulations develop themselves, and on their center, the openings of the fistulous tracts, which open on the cartilage, make their appearance. At times the wound closes; but, after a short interval opens again, or another forms at another point. There is then a repetition of the same course of treatment by caustic applications,—but generally, this indicates a complication, and suggests the propriety of an operation. The injections are generally successful, however, and most certainly so if the caries occupies the posterior parts of the cartilage. They may even succeed in the anterior parts, when the animal is young and of good constitution. But if the cartilage has already become partly ossified, the caustic is irregular in its action, and the result becomes doubtful. If the caries is deep and extensive, and especially if the necrosis extends through and through to a point corresponding to the synovial capsule of the articulation of the last phalanx; or if the necrosis exists on the internal face of the cartilage, where it covers that structure, then the repeated injections of Villate's, or of any other caustic, may be followed by serious complications. An old or complicated caries will offer an increased resistance to the treatment by liquid caustics, in proportion as there is more or less difficulty in bringing them in direct contact with the necrotic points.

The third method of treatment is that of the removal of the cartilage. This operation, first recommended by Lafosse, senior,

in 1754, was often performed by his son, and may be considered one of the most valuable results of the application of anatomical knowledge to the practice of veterinary surgery. This operation was also performed by Bourgelat and his students, by Girard, Hurtrel Darboval, and was principally studied and described by Renault. In Germany, notwithstanding the writings of Langenbacher, Dieterichs, and Hertwig, it did not meet with approval, and English veterinaries seldom, if ever, resorted to it. At present, even in France, it is seldom performed, except in case of failure by the caustic injection treatment, and this is often the case where the disease is situated in the anterior part of the fibro-cartilage, where the cartilaginous tissue predominates, or where the vitality is diminished, and above all, where ossification has taken place. It is an operation of the greatest delicacy, and accompanied with great risks on account of the proximity of the joint of the foot, and it requires an experienced operator and thorough practitioner to justify a hope of successful results. It consists in the excision, by layers, of the diseased cartilage, and in avoiding injury to the coronary band and to the podophyllous tissue, which are essential elements of the organization of the foot. It is also essential to avoid injury of the lateral ligament of the foot joint, which is close to the cartilage, and above all, of the synovial capsule of the joint, which is directly covered by the cartilage. The partial or entire extirpation of the cartilage can be performed. In the first case, only a portion of the necrosed fibro-cartilage is removed. Vatel, Sanstas, Renault, Bell and Lafosse have reported many cases of recovery by this mode of operation; but, it is not likely to be thoroughly successful, unless in circumstances as favorable as those accompanying the treatment by liquid caustics. It is generally much better when the operation is decided upon, to perform it by excising the entire structure, and removing all the carious elements. The partial removal is to-day entirely abandoned, and entire extirpation accepted as the true and only operative procedure. The best method of performing it is that recommended by Renault and adopted in our colleges. We shall make it the subject of description with all necessary details, and with various modifications as

performed by other practitioners ; we shall also offer some observations upon various other modes of performing the operation in question.

The operation includes two principal steps : first, the removal of the part, or the whole, of the wall corresponding to the diseased cartilage ; and second, the extirpation of the cartilage itself. The opinions of surgeons vary as to the amount of hoof which should be removed, and the extent of horny tissue to be taken off. In respect to the length of the superior border of the portion requiring removal, it is generally agreed that it must extend from the anterior extremity of the cartilage backward, that is, the two posterior thirds of the space reaching from the toe to the heels, or one-third of the circumference at the coronary band. But opinion continues divided as to the lower border. Lafosse, Senior, left it longer than the superior, and made the direction of the division of the groove correspond to that of the fibres of the hoof. Lafosse, Junior, accepting the idea of Solleysel and of Dieterichs, did not reach the sole with its groove, and removed only a portion of hoof parallel to the coronary band. Renault prefers crossing the fibres of the hoof with the groove, and brings the lower end of it to one-half the dimensions of the upper border, its groove running backwards. Rey considers that to be running too far back and too near the heel, and recommends the groove to be so made that the lower border will have the same length as the upper, and for that reason advises that it be as nearly parallel as possible with the line of the heels. Lafosse, Senior, removes [too large a portion of the hoof. Lafosse, Jr., leaves a portion of hoof which not only is useless, but which interferes with certain steps of the operation, when with the double sage knife, the skin is separated from the external surface of the cartilage, and also, when this is removed ; and again, there is a separation between the severed portions of the quarters much greater than occurs in the process of Renault, which, like that of Rey, exposes the entire cartilage, and greatly facilitates the operation.

It is to be understood that the foot has been prepared ; that the hairs have been clipped over the skin covering the cartilage ;

that the sole has been pared thin, down to the blood, as well as the bar corresponding to the diseased cartilage, so that the quarter has been allowed to project below the sole, to facilitate its eversion. The foot has been, moreover, well prepared by two or three days of poulticing, to render the hoof easier to be cut by the instrument, and the operation easier to perform, and therefore shorter in its various steps, besides placing the patient in the best condition for the endurance of so serious an operation.

After casting the animal upon a good bed, and fixing the feet, placing a temporary tremoslater with a strong cord, similar to a tourinquet, around the coronet, a groove is made, using various sized drawing knives, running from the anterior angle of the lower border of the cartilage downwards to the sole, following the direction recommended by Lafosse, Senior, Rey or Renault. This groove, made first with the widest, and finished with the narrowest of the drawing knives, must not touch the podophyllous tissue, and still must run through the entire thickness of the wall, without producing hemorrhage. In this step of the operation, as Girard correctly observes, short cuts of the knife are always better and quicker than those made by scraping or dragging with the instrument. It is also important to come down to the soft tissue at the coronary band first, and successively downwards to the inferior border of the wall, as otherwise, as the instrument is moved from above downwards, with a certain amount of force, it might slip and cause a serious division or laceration of the podophyllous tissue. The separation is then made of the wall from the sole by another groove, extending from the end of the groove already made, on the quarter, back to the heels. This is done without difficulty, with a small drawing knife, when the foot has been properly prepared. There is, however, one point which usually offers more or less resistance when the quarter is removed. It is that where the wall is continued to the bars. This resistance is sometimes so considerable, that if much traction is made, the wall will break more or less in front of the heels, where it is comparatively thin, and it may consequently become necessary to remove, by itself, the portion which has remained attached. This little accident, however, can be avoided by

ascertaining certainly before the extraction of the wall is effected, that the continuity of the wall and bars has been cut off. This being the case, the complete separation of the wall from the sole is made by running the sharp edges of the double sage knife through the structure of the living tissue underneath. The retraction of the quarter can then be proceeded with.

For this purpose a properly constructed lever is carefully introduced into the groove before mentioned, at the wall and sole of the foot. The inferior and anterior angle of the hoof at this point being then carefully raised, an assistant grasps it with the nippers, turning it back, tears it slowly, while the surgeon, with such a motion of the lever as may be necessary, assists in the tearing off of the portion of the quarter requiring removal. If adhesions remain, interfering with this manipulation, they are removed by cutting with a sharp instrument. As this separation of the wall reaches about to the coronary band, the separation is very easy, and no fear of lacerating the soft structures need be entertained. Care is necessary at this step, however, to avoid injuring the coronary band and the podophyllous tissue; to prevent which it will be prudent on the part of the assistant to press upon the band as the separation takes place.

This being accomplished, the edges of the wound are carefully examined; any projections remaining are removed, and the blood is sponged off. The double sage knife is then carefully plunged, with the convexity turned upward, (that is, towards the skin) between the external surface of the cartilage and the internal face of the skin, below the border of the coronary band, and then carried forward and backward, or as required, until the separation between the skin and the cartilage is completed, and the entire external surface of the cartilage is exposed. In moving the instrument backwards, it is necessary to be very cautious, especially while carrying the sharp edges downwards and inwards, in order to avoid injury to the coronary band and the skin, of which, however, there can be but little danger, when the knife is carefully held and properly directed. The succeeding step is to separate the skin from the cartilage; it is to be carefully raised and separated from its attachments underneath, which is some-

times a process quite difficult to accomplish, as the skin has always become more or less tumefied, and therefore has lost much of its natural flexibility and suppleness. Some operators, in order to avoid these difficulties, and overlooking the functions of the coronary band, cut it and remove it, with those portions of the skin which cover the cartilage. Others, more conservative, (Herting for example) cut it only through the middle, until they reach the superior border of the cartilage, and then, raising the two flaps of the skin, accomplish the same result with less cutting.

The destruction of the principal organ of the secretions of the hoof having been involved in the first method, and having now taken place, it can never be restored to a healthy condition, and the animal continues to be exposed to the frequently serious complications of "false quarter." By the second method, the production of a new wall is nearly always accompanied with the formation of a "quarter crack." The recovery is slow in either case, and more or less deformity is likely to follow. It is, then, the better and wiser plan to employ the mode of separation of the skin from below, and to avoid the division of the coronary bands or of the teguments.

The next step is the removal of the cartilage altogether. This is done with the single sage knife, held firmly in the hand, either the left or the right, always, however, that corresponding to the side of the heel to be operated upon. Taking a point of rest with the flat of the thumb upon the plantar surface of the foot, the instrument is pushed between the skin and the cartilage, and the sharp edge turned backwards, with a firm rotary motion, downwards and forwards. The detached portion of cartilage is then seized with a pair of bull-dog forceps, and brought outwards, and the sage knife is brought forwards, downwards and outwards, from under the cartilage. It is a good plan, in order to make more room for working, to raise the skin and coronary band with a blunt tenaculum. The operation should always be commenced at the posterior part, in order to avoid the articular synovial capsules, which might be opened if the removal of the cartilage were begun forward. As the operator reaches the anterior part of the cartilage, which is situated almost over this

capsule, it is prudent to hold the foot in excessive extension and thus avoid injury to the capsule. This is an important point to consider in the operation. The sharp instrument being carefully handled, every portion of the cartilage is taken off, either at once or by layers successively, until the whole is removed. It is thus accomplished in three or four pieces. In some instances the anterior portion is cut off by a longitudinal incision, made with a straight bistoury, following the direction of the posterior face of the coronet; the object, in this case, being simply to render the operation easier. The cartilage is thus removed, great care being taken to avoid opening the capsular articular bursæ. It is essentially necessary to remove the whole of the diseased tissues, in order to bring the parts into the condition of a simple wound. Still there need be no alarm if some small portions remain, more fibrous than cartilaginous, which, deep as they are, may protect the synovial capsules or the ligament; and moreover, they often slough off by themselves, with the abundant suppuration which follows.

To operate with the greater facility, it is well to have two forms of sage knife, one right and one left-handed, and some of extra strength, with which to remove the larger particles of cartilage, the others being small, thin and light, being adapted to the more careful dissection necessary towards the lateral ligament, and about the synovial bursæ of the joint.

Towards the end of the operation, the surgeon will, with the finger, carefully explore the condition of the parts, to assure himself that the cartilage is entirely removed; that the articular synovial sac has been preserved intact; that the ligament of the joint remains perfect; and that the parts are well washed and ready for the dressings. Although in the absence of possible complications, the operation is now finished, it may yet be followed by some serious sequelæ, which we will next consider.

The operation may become complicated by a variety of attendant and accessory *circumstances*. Among these are, the opening of the articular capsules; the wounding of the anterior lateral ligament of the articulation; the ossification of the fibro-cartilage; caries of the os pedis; and the alteration of the coronary band and of the reticular tissue.

The *opening of the articular capsule*, either during the operation, or by ulcerative process, is not so serious an accident as it was originally thought to be. Still, however, it requires some attention. It only become dangerous when the ulceration is accompanied by serious disorganization, and especially when it is associated with purulent arthritis. (Renault, Hurtrel, D'Arboval, Bernard). It is treated by simple pressure, camphorated paste, a little corrosive sublimate mixed with starch, or better, with *Egyptiacum* ointment.

The *wound of the ligaments* has also been considered a very serious accident, which, according to Girard, cripples an animal permanently. But Lafosse thinks this an exaggerated notion, and claims to have witnessed the radical recovery of animals after the necrosis and sloughing of the ligament.

If *ossification of the cartilage* is discovered during the operation, the removal of all the unossified portion is first proceeded with, in order to prevent a recurrence of the disease. The extirpation of the osteo cartilaginous portion is then effected either with a small drawing knife, or the gouge, or the bone forceps. The removal is made as far as the ossification is found to be complete, the operator making sure that every portion of cartilage is thoroughly destroyed. If the ossification is but partial or irregular, the surgeon must be guided by the condition of the parts. When the entire cartilage has undergone ossification, its susceptibility to caries has ceased.

When *caries of the os pedis* exists, the part must be destroyed with the sage knife, the gouge, or the chisel, according to the existing conditions. But in this case, portions of the reticular structure require removal, of which, however, as little as possible should be destroyed.

It may happen that the *portion of the coronary band* covering the cartilage may be *destroyed*, either wholly or in part, either as an effect of the disease, or by accident during the operation. In the first case, if the entire band has been destroyed, there is nothing to be done. But in the other case, if any portions of it remain, care must be taken to insure their preservation, as they may supply the necessary elements for a new, healthy secretion

of hoof, and the quarter may grow again, more solid and less deformed. If the wound of the coronary band consists merely in a simple division of limited extent, the wisest course will be to attempt to obtain union by immediate adhesion, or first intention, by bringing the edges of the incision together and maintaining the contact by careful dressing. When the *alteration of the reticular tissue* alone, is present, it is very essential to avoid the excision of the injured laminae. It is, in fact, the better course to avoid wholly the use of sharp instruments, and to leave to the natural process of suppuration the removal of the disorganized parts. Renault having observed how their removal interfered with the reparative process, has often left them undisturbed, even when their dark color and softened condition indicated the smallness of their chance of conservation. The success of the operation after a first dressing, has shown the wisdom of the plan of non-interference; they were found covered with a new layer of yellowish hoof; and D'Arboval has on several occasions observed the same results.

The dressing must be methodically and carefully applied. Done well, a dressing greatly assists in the recovery, while many, when badly performed, have been the cause of serious complications, which have greatly hindered the repairing process, and often, indeed, rendered a disease incurable, which need not to have been beyond remedy. In the application of the dressing, two points are important to consider; first, we must dress the subcutaneous wound, resulting from the separation of the skin and the extraction of the fibro-cartilage; the other, that of the sub-horny wound, produced by the removal of the portion of the quarter. Both are important, but the second requires the greater care, and is more difficult and more important than the former; any excess in the sanguineous circulation must be prevented, and excessive granulations must be kept under control. The dressing, then, must be somewhat compressive, without being excessively rigid, in order to obviate possible danger of excessive inflammation; not too loose, and so soft as to allow hemorrhage, or the undue proliferation of granulations. It must be both supple and firm, and of an even and uniform pressure. The proper

material is balls of oakum for the subcutaneous wound, and pads of the same material for the sub-horny, the first being moistened with alcohol, while the others are made dry.

It is in question whether we should aim to obtain immediate adhesive union of the wound resulting from the removal of the cartilage, or in other words, whether it is good treatment to introduce some material of dressing between the skin and the bottom of the wound. Here opinions vary. Our belief is, that this union is by no means easy to secure; and that the removal of the cartilage, more or less altered, prevents it at various points. Still, we must not raise the skin too much, and choosing a middle course between, only a small soft ball of oakum is now placed in the deepest part of the wound, or a thin pad is placed between the two parts, sufficient to represent about the natural form of the part, being enough, however, to prevent the immediate reunion from taking place.

A light thin shoe having been prepared, adapted to assist the application of the dressing and its holding properly, it is put on with one of its branches cut off short on the side where the operation has been performed, while the other branch projects backwards beyond the heel, to support the rollers of the bandage of the dressing. Desplas had thought to turn up that long branch of the shoe in the shape of a hook to assist in holding the dressings. This is generally useless. Some veterinarians prefer to leave the animal unshod, but in that case, the bandage is more likely to slip off. The shoe must be put on while the animal is down, and before the application of the dressing. With some practitioners, that is the moment for the removal of the tourniquet or cord, which had been applied at the beginning of the operation in order to prevent the bleeding. This is an unnecessary precaution, and only renders the application of the dressing more difficult. First, balls of oakum are placed over the coronary band, then, upon the points of union of the preserved wall and of the podophyllous tissue, and then all over the wound. We must endeavor, as Renault says, to give the dressing a cylindrical form, or rather, according to Rey, hemispherical, after which the whole is covered with pads and rollers. These must

be put on in abundance, the rollers passing above the branch of the shoe on the sound side, and running successively from above downwards, and generally from before backwards. Flat feet require special care in dressing, and the fore-feet are generally more difficult to dress than the hinder. When all is finished, the animal has to be watched for several days. Ordinarily, after the operation, there is abundant hemorrhage, occurring within some fifteen minutes, and oozing through the dressings. This requires no special attention, and generally ceases spontaneously, or by the pressure of the dressing, or by the use of the cold bath. If the dressing seems to be too tight, and the animal shows signs of acute pain, with strong reactive fever, it is not therefore necessary to remove the dressing, but may be sufficient simply to loosen the bandage. The animal should be placed in a wide stall, or box, if possible, where he may move freely, and lie down easily; and he must be prevented from tearing off the dressing by the application of a neck cradle. A low diet is necessary for several days, in some instances mashes being the only food allowed. Still, a good appetite and lively condition are always good signs.

The interval of time which should be allowed to elapse between the operation and the removal of the first dressing, should be judged by the amount of pain which the animal seems to suffer; by the temperature of the atmosphere; and by the amount of liquid discharge found oozing from the wound and moistening the dressing which covers and protects it. Generally, the dressings should be disturbed as late and as seldom as possible. Circumstances will sometimes occur, however, which necessitate their removal earlier, as for example, the extreme heat of the weather; the extremely offensive odor proceeding from the diseased parts; and a sudden and evident increase of pain in the wound, without any known cause. Under these circumstances, which however, are of rather infrequent occurrence, it is sometimes necessary to remove the dressing as early as the third day, although at this time, as suppuration is not yet well established, the operation is quite painful, and may be accompanied by free hemorrhage. But if the weather is not excessively warm; or if

the pain is not excessive; or the dressing remains dry on the outside, and matters seem to be generally in good condition, the better course is to wait from eight to ten days, before the dressing is renewed. Indeed, numerous cases are on record when a still longer period has been allowed to elapse, and the re-dressing has been deferred to the extent of three weeks, or longer. In any event, great caution must be exercised in the removal of the dressings, and the surgeon should be careful to have all his appliances ready in advance, in order that the wound may be exposed to the air for the shortest possible space of time. When exposed, the wound should be of a red color, with commencing granulations, and a temporary hoof, soft and whitish in appearance, should be visible on the podophyllous tissue. A dressing is then applied of tincture of aloes, or a weak solution of iodine. At a later period the dressings are changed at intervals of about eight days, and an application is made of pulverized sulphate of copper, in order to facilitate the drying and hardening of the soft hoof. Baths of sulphate of iron, with a small portion of sulphate of copper, are of service in promoting and hastening the cicatrization.

About the thirtieth or fortieth day after the extirpation of the cartilage, the animal may be put to light work. But three or four months, if not a longer period, must elapse, before it will be safe to task him with heavy labor. Towards the end of the assigned term he should be fitted with a bar shoe, shortened on the side where the quittor has existed. If the dressing is skilfully applied and proper care is exercised, the diseased foot may be sufficiently protected, and the animal made to resume his work with safety.

In time, the portion of hoof secreted by the coronary band unites with that of the podophyllous tissue, and after a few months, no remains of the operation are visible. But if the coronary band has ulcerated; if the skin has been divided; if by contact of the firing iron, or application of caustics, it has been destroyed; the quarter then presents irregularities, and sometimes divisions, which may be of long continuance, and give rise to a lameness which may, perhaps, become permanent. This

danger indicates the necessity of exercising the utmost skill and caution in operating, in order to avoid possible injuries to the coronary band.

Several *modifications* of the ordinary mode of operation have been proposed. Some have had for their principal object, the prevention of the extraction of the hoof, with a view of thus returning the animals to their work at the earliest period practicable. It is thus that Hazard, Junior, proposed to make a crucial incision upon the skin covering the fibro-cartilage; the four flaps being so dissected to expose it, and then removing it with the sage knife. In this process, the extirpation of the entire cartilage becomes extremely difficult without inflicting injury upon the lateral ligaments and the synovial capsules.

Pagnier has proposed to merely thin down the quarter, to make an incision in the skin along the superior border of the cartilage, and through this to remove the organ. But in this operation, however thin the hoof may be, it always interferes with the entire extirpation of the cartilage.

Bernard, following the idea of Lafosse, junior, who only removed the superior border of the wall, proposed a mode of proceeding which is principally useful in cases of separation of the hoof. Instead of removing the band of hoof parallel with the coronary bourlet, Bernard pared it down with the drawing-knife, the sage-knife, or the rasp, in order to make it as thin as possible, while avoiding the injury to the sensitive laminae. This done, an incision is made along the coronary band, below it, destroying its union with the laminae. At this step of the operation, the indications are the same as in the ordinary *modus operandi*, except that the coronary band being covered with a certain thickness of hoof, is less flexible. This, however, is easily removed, as soon as it becomes softened. The remaining steps of the operation are the same as in the ordinary, old way. That is to say, the posterior part of the cartilage being well defined, the sage-knife is used in the same manner. In this method, however, as the sage-knife works more flat-wise, there is less danger of wounding the ligaments or the synovial capsules. If any part of the cartilage remains near these organs, some care must be used

in removing it, and it must be done by degrees, and in very small portions.

The advantages of this process are, 1st, the avoidance of extensive wounds, and of the extreme pain produced by the extirpation of the quarter. 2d, to keep the foot shod, and to allow the animal to resume his work as soon as the first pain has subsided, which may occur at quite a considerable interval in advance of the perfect cicatrization of the wound. 3d, to avoid long and frequently-repeated dressings.

In this method, however, the quarter left intact sometimes interferes with the operation, and the excision of the cartilage is more difficult, being only practicable, indeed, in cases where there is a separation of the wall.

Maillet has modified the method of Bernard, so that, instead of thinning down the band of hoof, he only applies the rasp upon the quarter, and thins down with it all that portion which is extirpated in the process of Renault, and availing himself also, of the drawing and sage-knife. The remaining details of the operation are like those of the ordinary processes. An objection to this mode is that it can be put in practice only in cases where there is already a separation of the wall. It is objectionable from its tendency to weaken the foot too much, by interfering with the firm and solid adjustment of the shoe, as well as retarding its application to the hoof.

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